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President Uhuru Kenyatta's personality and the strained Kenya – International Criminal Court Relation between 2013 and 2017

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Abstract

Scholarly debates on the strained Kenya – International Criminal Court (ICC) relations are mainly premised on state centric assumptions of the need to respect Kenya's sovereignty and national integrity; ignoring how the personality of President Uhuru Kenyatta influenced Kenya's foreign policy towards the ICC. Guided by Leadership Trait Analysis (LTA) approach, this paper seeks to fill this lacuna by undertaking quantitative content analysis using profiler plus software, on three interviews, and two speeches purposively sampled from utterances delivered by Kenyatta between 2013 and 2017, where he addresses matters relating to ICC; with the aim to measure his nationalistic personality trait. The results reveal that Kenyatta is low in nationalism. This explains the shiftiness of Kenya's foreign policy towards the ICC, and Kenya's preference in using positive diplomatic gestures such as summits, conferences and letters while castigating the ICC and its allies. The results further explain why the Kenya – ICC relations strained.

Key Words: International Criminal Court, Uhuru Kenyatta, Nationalism and Foreign Policy

Introduction

The protest letter against the International Criminal Court (ICC) by the Kenyan Permanent Representative to the United Nations marked the clearest diplomatic debacle between Kenya and the ICC. The letter, dated 13th May, 2013, addressed to the United Nations Security Council (UNSC), further defined the enduring scholarly and policy debates on the strained Kenya – ICC relations (Helfer & Showalter, 2017). Kenya had called on the UNSC to have the case against the then elected President, Uhuru Kenyatta, to be terminated on the grounds that the ICC process was lacking impartiality, threatening national and regional security and stability, and further violating Kenyans' wishes of being governed by their duly elected president (Lynch, 2014). It also asserted that

Kenya had the capacity to offer local solutions to her challenges, and interference by the ICC was an attack on her national sovereignty and integrity (Hodgins, 2015).

The call for the ICC to respect Kenyan sovereignty was echoed by Uhuru Kenyatta during the 26th Extra – ordinary summit of the African Union. At the summit, Kenya led the charge for mass withdrawal from the ICC, accusing the Court of being a neo – colonial tool; keen on stumbling on the sovereignty and national honour of African states (Derso, 2013). ICC's alleged lack of adherence to the principle of immunity from persecution accorded to heads of states, was also presented as evidence to buttress its intent to erode Kenya's sovereignty, and a show of lack of respect for national honour (Labuda, 2015). While

relying on the argument on national sovereignty to explain Kenya's antagonistic foreign policy towards the ICC, it has been lost in this debate, that the case at the ICC was personal to Uhuru Kenyatta. It was not a case against the Kenyan state.

Making the case for sovereignty against the ICC, Kenyatta poised himself as a nationalist, keen on championing national honour and autonomy (Brown & Raddatz, 2014). Through his utterances, Brown and Raddatz add, Kenyatta sought to brew a perception that he was victim of global power imbalance for his anti – imperial stand against the ICC. His claim for nationalism was further witnessed when he sought to tie Kenya's fifty years of independence celebrations to proclamations of national sovereignty against the West, and to disrepute the ICC (Brown & Raddatz, 2014). Furthermore, the impetus for formation of the Jubilee Party, on whose ticket Kenyatta won the election, has been attributed to the demonization of the ICC (Muller, 2013; Kendall, 2014).

However, cases exist of political elite mythmaking. Wang (2012) describe elite mythmaking as the deliberate manipulation of historical facts by political leaders who pose as nationalists, with the aim of evoking the deepest nationalistic feelings among the populace in an attempt to achieve personal interest through particular foreign policy decisions. In light of this affirmation, there exists a need to explore how nationalism as a personality trait inherent in President Uhuru Kenyatta, influenced Kenya's antagonistic foreign policy towards the ICC between 2013 and 2017. This is against the dominant narrative advanced when discussing the strained Kenya – ICC relations, which is statist in nature, and proposes that the ICC process was an affront on Kenya's sovereignty and national honour. This narrative has ignored the centrality of

individual leaders involved in foreign policy decision making, and how their personalities influence foreign policy outcome towards international criminal law regimes.

This paper will attempt to fill this lacuna, by introducing nationalism as a personality trait inherent in Uhuru Kenyatta, into the discussion on the strained Kenya – ICC relation. Guided by LTA approach developed by Margaret Hermann (1980); which asserts that leaders are central in determining their nations' foreign policy, and hence their personalities should be mainly considered when analyzing foreign policy outcomes. The approach further provides how to measure various personality traits, using content analysis schemes on leaders' speeches and interviews and using the result of such measures to determine the foreign policy behaviour of their nations. The approach is extensively discussed in section three of this paper.

In determining the nationalist trait of President Uhuru Kenyatta, the paper shall undertake quantitative content analysis of two purposively sampled speeches and three interviews of Uhuru Kenyatta given at five different instances, between 2013 and 2017. The choice for this sample was guided by inference as the speeches and interviews contain Kenyatta's addresses on the Kenya – ICC relations, and further that they were delivered during the first term of his presidency between 2013 and 2017, when he was at the helm of the nation's foreign policy making structure (Adar, 2015). The intention is to provide an analytical approach on how nationalism as a trait inherent in him, influenced the strained Kenya – ICC relations between 2013 and 2017.

Nationalism, Foreign Policy and the Kenya – ICC relations

Nationalism is a person's worldview in which their nation holds center stage

(Hermann 1980), and is depicted by strong emotional ties to their nation with emphasis on national honour and identity (Baum 2015). It is therefore a driving force that is intended to foster a prescribed behaviour of patriotism by an individual in their role in domestic national affairs (Piston & Hachter, 2000).

Consequently, nationalism has also been documented as a pivotal factor in advancing wars and a threat to global peace and stability (Lambeth, 2010). For this reason, the place of nationalism in the study of International Relations and the sub – field of Foreign Policy has gained currency. In buttressing this argument, attempts have been made in associating nationalism to the ravages of World War I and II (Baum, 2015). The wars have been attributed to nationalism among Germans under the leadership of Adolf Hitler, and nationalism among the Japanese under the leadership of Emperor Hirohito (Baum, 2015).

Dominant literature linking nationalism and foreign policy have focused on the nationalism of the people within nations, or popular nationalism, as the key determinant of foreign policy (Baum 2015; Momodu, 2018). This is guided by a conservative statist assumption that individual identification with the nation, can only be analytically aggregated into masses that can mobilize and generate public opinion; which may impart on a nation's foreign policy (Duijker & Frijda, 1960).

However, with the wide scholarly acceptance of the centrality of individual leaders as a unit of analysis in foreign policy decision making; (Kesgin, 2012; Schuring, 2018; Khandal, 2018) the need to look into nationalism of individual leaders, and how it imparts on their nations foreign policy is urgent (Khandal, 2018). This is advised by the proposition that nationalism is a pivotal ideology that

informs the way state elites formulate and implement foreign policy (Mylonas & Kuo, 2017). In Kenya, foreign policy decisions – making has been excessively dominated by the presidency (Adar, 2015). Proponents of this assertion add that the top leadership of the country, headed by the presidency, is the carrier of the nation's vision in International Relations (Nzomo, 2016). The Constitution of Kenya (2010), also places the responsibility of multilateral and bilateral treaties on the presidency (Kaburu, 2020). This has created the “big man” syndrome in foreign policy decision making (Adar, 2015; Nzomo, 2016).

In the face of this evidence, studies that attempt to analytically explore how nationalism as a personality trait inherent in Uhuru Kenyatta could have shaped Kenya's antagonistic foreign policy towards the ICC between 2013 and 2017 remain unavailable. This is despite existence of words and phrases in Kenyatta's political utterances on the Kenya – ICC relations which connote nationalism, and as suggested in some descriptive scholarly discussions on the strained Kenya – ICC relations (Helfer & Showalter, 2017).

Leadership Trait Analysis (Centrality of individuals in foreign policy)

Leadership Trait Analysis theory was developed by Margaret Hermann (1980) and has three key assumptions which guide the arguments and the structure of this paper. First, the approach advances that leaders are central in determining foreign policy behaviour of their nations and therefore focus should be placed on their personality when undertaking foreign policy analysis. Based on this assumption, this paper explores the personality of President Uhuru Kenyatta in analyzing the strained Kenya – ICC relations. By focusing on the individual and not the state, the paper provides a paradigm shift from

dominant literature on Kenyan foreign policy towards the ICC; which view the state as a separate unitary actor, and advances statist arguments such as sovereignty and national integrity, as the key determinants of the Kenya's foreign policy towards the ICC.

Second, the approach assumes that when analyzing a leader's personality and how it influences foreign policy, their personality should be fragmented into fine psychological components referred to as personality traits. Hermann (1980) identifies seven politically relevant personality traits which are; nationalism, need for power, belief in ability to control events, distrust of others, self – confidence, task focus and conceptual complexity. This paper only explores nationalism which is one of the traits identified by the approach, and seeks to explicate how nationalism as a trait inherent in Uhuru Kenyatta, influenced the strained Kenya – ICC relations. The choice of nationalism is guided by reviewed literature on Kenyatta's political pronouncements, which depict him as a nationalist keen on defending the sovereignty and integrity of his country against attack by the ICC.

Third, the approach assumes that high profile political leaders are inaccessible and therefore may not be available for psychological assessment (Hermann, 1980; Lodge & Taber, 2000) and therefore their spontaneous public verbal outputs such as interviews and speeches, when processed by content analysis schemes tied to psychological notions, can expose fundamental information about their personality traits and decision style (Winter, 2003). This assumption guides the methodological underpinning of this paper. In exploring the nationalist trait of Uhuru Kenyatta, and its influence on Kenya – ICC relations, the paper undertakes quantitative content analysis on three purposively sampled interviews and two speeches of Uhuru

Kenyatta. These speeches and interviews are publicly available, and capture Kenyatta's sentiments on Kenya's relations with the ICC.

To comprehensively determine a leaders' personality trait, Hermann prescribes using at least five thousand words from both speeches and interviews delivered by the leader. This paper utilizes a total of five thousand eight hundred and fifty-three words from the three interviews and two speeches. This implies that the data utilized in the paper is sufficient for making factual inference on Kenyatta's nationalistic trait.

In grounding the theory, Hermann (1980) explored the leadership styles of 87 heads of states from 46 Countries and 122 national leaders from 48 countries, and developed a norming group against which a leader's personality traits could be measured. If the leader's scores are a standard deviation below the norming groups' mean, then the leader is low on the particular trait under investigation, and if the leader's scores are one deviation above the norming groups' mean, then he is considered high in the trait under investigation. However, when the leader's score is close to the norming groups' mean, then the leader is considered moderate in respect to that trait. All the scores of high, low and moderate then distinctively explains the leader's foreign policy behaviour; how leader formulates and implements foreign policy.

In measuring the trait on nationalism which is the focus of this paper, Hermann (1980) proposes that while undertaking content analysis of the speeches and interviews, the researcher should focus on how frequently the leader uses nouns and phrases referring to his nation, and favourable modifiers denoting strength of his nation or phrases suggesting importance of national honour or identity. In addition, the frequency of use of modifiers that connote weakness when

referring to other nations, or use of phrases that suggest meddlesomeness and interference in the affairs of their nation. Going by the frequency of use of such nouns and modifiers in the utterances by Uhuru Kenyatta, we then establish if he is high, low or moderate in nationalism. This is measured against the norming group developed by Hermann (1980), highlighted in the methodology section of this paper. The result of this measure guides the discussion on implications of Kenyatta's nationalistic trait on the strained Kenya – ICC relation.

Structurally then, the paper first undertakes quantitative content analysis on the speeches and interviews by Uhuru Kenyatta to find if he is high, moderate or low in nationalism. Using this findings, the paper discusses Kenya – ICC relation between 2013 and 2017, guided by the propositions advanced by the Hermann on nationalism. Hermann (1980) stipulates three main suppositions of leaders high in nationalism. One, they tend to be very interested in maintaining their nations as separate entities as they are obsessed with sovereignty and national honour. Two, such leaders view the world from a “we” verses “them” (friends verses enemies) perspective, and are too quick to view other nations and external institutions as challenging the status of their nation. Three, such leaders use external scapegoats, who are their perceived enemies, as the cause of their nation's problems. On the other hand, Herman (1980) advances that leaders low in nationalism are less prone to view the world in black and white terms, and tend to categorize other nations as “we” versus “them” based on the nature of diplomatic situation at hand. Their categorization therefore remains fluid making their foreign policy decisions shifty. In addition, such leaders tend to be less likely to use scapegoats in dealing with local opposition to their foreign policy

choices, and prefer to use positive diplomatic gestures such as conference and summits in dealing with opposition to their foreign policy choices. These presumptions on nationalism advanced by Hermann on the foreign policy behaviour of leaders, shall guide the discussion on the strained Kenya – ICC relations which this paper shall undertake after exploring whether Uhuru Kenyatta is high, low or moderate in nationalism.

Methods and Data Sources

This paper adopts an exploratory case study design. The design enables the paper to move beyond answering the “what” question in the debate on Kenya – ICC relations, to answering the “how” and “why” question (Baxter & Jack, 2018) using the case of Uhuru Kenyatta. Consequently, the design remains relevant, since literature on the personality of Uhuru Kenyatta and how it influences the Kenya – ICC relations remains unavailable, hence warranting an exploration. The advantage of using a case study is that it enables the intense analysis of Uhuru Kenyatta who is the subject matter of this research.

The study area of this paper comprises of utterances of Uhuru Kenyatta in the form of speeches and interviews delivered between 2013 and 2017 at various events and instances where he discussed matters relating to the Kenya – ICC relations. The study seeks to contribute to the field of International Relations, and particularly in the sub – field of foreign policy analysis. The speeches and interviews were downloaded from YouTube where they were readily available and can be made reference to for the purposes of verification of the data. Since the source is a public utility source for information and data, there was no need for special approval prior to the use of the data. YouTube has gained currency as a source for data as is evidenced in studies such as Wambui (2016), which

have utilized YouTube as reliable data source with great success.

This paper utilizes purposive sampling. The speeches and interviews analyzed in this paper have been purposively sampled by the research among a innumerable number of speeches and interviews by President Kenyatta between 2013 and 2017. A perfunctory review of the speeches and interview provide insight into Kenyatta's views on Kenya – ICC relations. The excerpts from the speeches and the interviews are purely from the sections where Uhuru Kenyatta address matter particular to the ICC. Furthermore, the speeches and interviews were given between 2013 and 2017, when the Kenya – ICC relations were at their worst, with Kenyatta as the president of Kenya. Cumulatively the word count from the speeches and the interviews is five thousand, eight hundred and fifty-three (5,853), and has surpassed the five-thousand-word mark prescribed by Hermann (1980). The data are thus sufficient to provide an objective

measure on the nationalism trait of Uhuru Kenyatta.

Investigations on political leaders' personality traits, require inimitable methods of data collection, as leaders are not readily available or willing to be interviewed for psychological analysis (Kesgin, 2012). Due to the difficulty of direct access to such political leaders and to their private materials which may reveal their personal characteristics (Dyson, 2006); studies have used content analysis techniques to analyze data when examining leaders' personality traits (Winter, 2003; Khandal, 2018), what Dyson (2006) refers to as at – distance – measure techniques. The speeches and interviews utilized in this paper, are as shown in Tables 1 and 2 below. They exist in audio – visual format as accessed from YouTube. The data was downloaded into the researchers' personal computers and transcribed into text and coded for quantitative content analysis using the LTA coding scheme.

Table 1 – Typology of Speeches by Uhuru Kenyatta

S/No	Speeches	Date	No of Words
US1	Speech at the 26 th African Union Summit in Addis Ababa	31/Jan/2016	2659
US2	Speech at the Joint Sitting of the Kenya Parliament	06/Oct/2014	2243

Table 2 – Typology of interviews by Uhuru Kenyatta

S/No	Interviews	Date	No of Words
UI1	Interview with Marc Perelman on France 24	26/April/2016	535
UI2	Interview with Daniel Pelz on DW News – DW African Desk	08/April/2016	145
UI3	Interview with Husein Mohamed on Citizen TV Kenya	09/April/2014	271

Content Analysis

Content analysis is a technique for making inferences by objectively and systematically identifying specified characteristics of messages (Krippendorff, 2004). There exist two

key categories of content analysis; qualitative and quantitative content analysis. Qualitative content analysis on the one hand is viewed as a summative content analysis that focuses on interpreting and meaningfully

describing evident themes in the text when framed against the research objectives. On the other hand, Quantitative content analysis according to Rose et. al. (2015) is the statistical and systemic analysis of text, which involves the classification of parts of a text through application of a structured coding scheme, counting and comparisons, usually of key words or content, followed by the interpretation of the underlying context. This enables the researcher to draw conclusion about the message content. This paper exploits quantitative content analysis since it uses the coding scheme for LTA to measure personality traits against the norming group developed by Hermann (1980). This scheme involves counting words and phrases which are indicative of a particular leadership trait, in this case nationalism, and finding the percentage of the use of such words and phrases within the speech or interview.

Winter (2003) alludes that this kind of measure requires a properly designed procedure of coding and operationalizing personality measures. In this regard, the paper employs the Leadership Trait Analysis coding procedure developed by Hermann (1980). The procedure is founded on the assumption that by establishing a leader's trait; a researcher may predict the leader's predisposition when faced with a foreign policy task. The procedure further alludes that the leader's lexical choices mirrors their personalities, and hence leadership trait analysis is quantitative in nature as it employs frequency counts. In this case, once the measure on nationalism as a personality trait inherent in Uhuru Kenyatta is established, then it is compared to the scores of a norming group developed by Hermann for Heads of States, which is shown second column of Table 3.

Table 3: Norming group for the measure of nationalism as a personal trait

Personality Trait	Heads of State	Political Leaders
Nationalism	Mean = 0.42 Low < 0.32 High > 0.53	Mean = 0.43 Low < 0.34 High > 0.53

In measuring nationalism as a trait, the units of analysis are words and phrases used by President Uhuru Kenyatta in making reference to Kenya. In particular, the researcher gets interested in whether he uses three types of modifiers when referring to Kenya. First, modifiers that suggest favour, by using words such as great, successful or prosperous among others. Second, using modifiers that suggest strength, such as powerful, capable, made great advances, among others. Third, phrases which suggest need to maintain national honour and identity, such as need to defend firmly our borders, must maintain our own interpretation, and decide our own policies, among others. It is based on the frequency of use of these modifiers in Kenyatta's utterances

when discussing issues around the ICC, that we determine whether he is high, low or moderate in nationalism as explained in section three of this paper. In a bid to ensure timelines and accuracy, the content analysis will be undertaken using Profiler Plus software.

Profiler Plus Results

To ensure accuracy and minimize human error associated with word count in undertaking quantitative content analysis, the paper has utilized Profiler Plus. This is a computerized software developed by Levine and Young (2014) for undertaking quantitative content analysis based on the coding technique developed by Hermann (1980). It has been widely used to explore the personality of various political leaders

(Kesgin, 2012).

The software provides various coding schemes; such as Operational Code Analysis, Verbal Behaviour Analysis and the Leadership Trait Analysis, to analyze a variety of texts. However, for the purposes of this paper, there was a bias for the Leadership Trait Analysis coding scheme. Profiler Plus categorizes words in the verbal outputs as indicative of either high or low in nationalism. It then scans Uhuru Kenyatta's verbal outputs for words and phrases where he refers to Kenya, Kenyans and Africa; which are considered in this paper as his group. While scanning utterances, the software identifies modifiers used by Kenyatta when referring to these groups to establish if they are showing favour, suggesting strength or the need to maintain honour and identity (Hermann, 1980). The score on nationalism is then calculated as being the ratio of words tagged as low, high or moderate for nationalism, and presented between 0 - 1. Zero being the lowest, one being the highest and a score close to the mean indicated in table 3 being moderate. This software has been hailed for reducing the time spent on analyzing content for leadership traits and for ensuring systemic and objective results (Kesgin, 2012).

Once the data is run through Profiler Plus for quantitative content analysis, the software undertakes statistical analysis to determine the number of times specific words, phrases, or parts of speeches and interviews that connote nationalism are used. The results are presented in numerical format, which includes the number of indicators within a particular speech or interview that depict Kenyatta as high or low in nationalism. The software further

provides the frequency of use of such words and calculates the ratio for each speech and interview, which is then measured against the norming group's mean to determine whether Kenyatta is high, low or moderate in nationalism. Since the software is a quantitative analytical tool, it only provides the numerical results but does not highlight the exact words or phrases; which is commonplace in qualitative content analysis.

The results will enable the paper determine if Kenyatta is high, low or moderate in nationalism. This will guide in the discussion of Kenya's foreign policy towards the ICC, in line with Hermann's (1980) propositions on how leaders' nationalistic trait influence foreign policy, as highlighted in section three of this paper. The paper shall further extract insights from the analyzed texts to discuss the strained Kenya – ICC relations.

Presentation of Profiler Plus Results

Table 4 displays the content analysis results as processed using Profiler Plus for the two speeches by Uhuru Kenyatta, (US1 and US2), and his interviews (UI1, UI2 and UI3). They have been presented against the norming group for political leaders on the trait of nationalism as displayed in the second column (Standard) of the table. The eighth column in Table 4 (UU), is the results for the cumulative utterances by Uhuru Kenyatta for both the speeches and the interviews. It displays the measure for all the five thousand eight hundred and fifty-three words. This will enable the paper reach a conclusion and determine a position on nationalism as a trait inherent in Uhuru Kenyatta; and how it influenced Kenya's relations with the ICC between 2013 and 2017.

Table 4: Profiler plus results on Uhuru Kenyatta's Speeches and Interviews

Trait	Standard	US1	US2	UI1	UI2	UI3	UU
NAT	Mean = 0.42 Low < 0.32 High > 0.53	0.2879	0.169	0.1429	0	0.3333	0.2086

In the first speech, US1, delivered at the 26th Extra – Ordinary African Union Summit, two thousand six hundred and fifty-nine (2659) words were analyzed using Profiler Plus. Nineteen (19) words were indicative of Uhuru Kenyatta as being high in nationalism; while forty-seven (47) words indicated him as low in nationalism. The ratio result of the speech is 0.2879, which is two (2) standard deviations below the mean of the norming group which is 0.42. In the second speech, US 2, delivered at the Joint Sitting of the Kenyan Parliament, a total of two thousand two hundred and forty-three (2243) words were analyzed. Profiler Plus depicted that of this total, 12 words were indicative of the leader being high in nationalism, while 59 words indicated him as low in nationalism, the resultant ratio was 0.169 which is 3 standard deviations, lower than the mean of 0.42.

In the first interview, UI1, conducted by Marc Perelman of France 24, a total of 535 words were extracted for analysis. Profiler plus reveal that of the total, 3 words were found to depict Uhuru Kenyatta as high in nationalism, while 18 words depicted him as low in nationalism. The resultant ratio for this interview was 0.1429 which is 3 standard deviations lower than the norming group. In the second interview, UI2 conducted by Daniel Pelz of DW News – DW African Desk, a total of 145 words were extracted for analysis. None of the words from the interview depicted Kenyatta as high in nationalism. However, 10 words from among those uttered by Uhuru Kenyatta during the interview depict him as low in nationalism. The resultant ratio was zero (0), which is 4 standard deviations below the norming

group on nationalism. In the third interview UI3, conducted on 9th April 2014, by Husein Mohamed of Citizen TV – Kenya, a total of 271 words were extracted for analysis. Of the total, 5 words were indicative of him as being high in nationalism, while 10 were indicative of him as being low in nationalism. The resultant ratio for this interview was 0.333 which is one (1) standard deviations below the mean of 0.42.

Cumulatively, of all the five thousand, eight hundred and fifty-three (5853) words from all the speeches and interview (UU), 39 words depicted Uhuru Kenyatta as high in nationalism while, 148 words depict him as low in nationalism. The Profiler Plus results for the cumulative utterances (UU), is 0.2086, which is 0.1114 standard deviations below the mean of the norming group.

Discussion on Implication of Kenyatta's nationalistic trait on Kenya – ICC Relations

Nationalism calls on leaders to emphasize the importance of their own nations in terms of their status and cultures (Hermann, 1980). Content analysis of Kenyatta's speeches and interviews processed through Profiler Plus, reveal that he scores lower than the norming group for the nationalistic trait in all the instances analyzed. A cursory review of some of the speeches and interviews further confirm this result, as there exists indicators which infer that Kenyatta viewed his case at the ICC as a personal matter. In US 2 delivered at the joint sitting of the Kenyan Parliament, Kenyatta attempted to isolate his case at the ICC from the sovereignty and independent of the nation, he said;

“... To all those who are concerned

that my personal attendance of the Status Conference compromises the sovereignty of our people or sets a precedent for the attendance of presidents before the court, be assured this is not the case..."

Excerpt from US 2 – Uhuru Kenyatta’s Address to the Joint Sitting of Kenyan Parliament delivered on 6th October, 2014

In UI 3, Kenyatta’s utterances further depict the ICC matter as a personal issue for both himself and his deputy, who was also accused at the ICC. Viewing ICC as a personal matter divorces it from the nation and hence makes him not perceive it as a national concern but as a personal concern. During the interview he said;

“...and as I said then, ICC for me is a personal issue and it will go away because I strongly maintain as I have always maintained, not only on my innocence, but also that of my Deputy...”

Excerpt from U13 – Uhuru Kenyatta’s Interview with Husein Mohamed on Citizen TV – Kenya undertaken on 9th April 2015

In the two excerpts above from US2 and UI3, Kenyatta does not directly link his groups to the ICC case. He keeps making reference to himself and attempts not to identify the ICC question with either the Kenyan state or Africa which are his groups. As guided by Hermann (1980), when leaders cease to make reference to the groups where they belong while discussing foreign policy questions, they are viewed as low in nationalism. The use of phrases such; “my personal”, “I strongly maintain” and pronouns such as ‘I’ vindicate this position. Based on the researches observations and profiler plus results on the analyzed speeches and interviews, we determine Uhuru Kenyatta as being **low** in nationalism.

In explaining foreign policy behaviour of

leaders’ low in nationalism, Hermann (1980) espouses two main assumptions on how such leaders influence foreign policy. First, she claims that such leaders are less disposed to viewing world politics as clear – cut, and are more likely to view people as “we” or “them” based on the prevailing diplomatic situation that they find themselves in, hence making their foreign policy decisions fluid. Second, she argues that in dealing with local opposition on their foreign policy options, they prefer to use interactions such as summit conferences and positive diplomatic gestures as strategies in mitigating domestic discontent. It is based on these assumptions that this paper shall look into documented cases of strained Kenya foreign policy behaviour towards the ICC. Using excerpts from the speeches and interview for emphasis, the paper shall attempt to explain these cases, hence answering the “why” questions in antagonistic Kenya – ICC relations, from a personality perspective, going beyond the “what” question which other studies seem to focus on.

The first assumption by Hermann, is manifest in Kenyatta’s actions and utterances on the Kenya – ICC relations. While attacking ICC, Kenyatta extended the attack to other nations that allegedly supported the ICC process in Kenya such as The United Kingdom, The United States and The European Union. In his speech US1, Kenyatta avers;

“...These interventions go beyond interference in the internal affairs of a sovereign State. They constitute a fetid insult to Kenya and Africa. African sovereignty means nothing to the ICC and its patrons. They also dovetail altogether too conveniently with the warnings given to Kenyans just before the last elections: choices have consequences. This chorus was

led by the USA, Britain, EU, and certain eminent persons in global affairs. It was a threat made to Kenyans against electing my Government..."

Excerpt from US1 – Kenyatta Speech at the African Union Summit

From the excerpt, “we” manifests by inference where Kenyatta makes reference to his groups; Kenya and Africa. He defines the groups as separate from the ICC and other countries which he refers to as ICC patrons. He views the ICC, the European Union and the countries he mentions such as USA and Britain as “them”, whom he accuses of lacking respect for Kenyan and African sovereignty. However, this position keeps changing due to the shifty nature of Kenyan foreign policy attributed to Kenyatta’s low nationalism.

It was further argued that due to the Kenyan cases at the ICC, Kenyatta was realigning Kenya’s foreign policy from the traditional western orientation to a more inward-looking foreign policy outlook (Obala, 2013). This foreign policy choice would therefore sever the previously cordial diplomatic relations between Kenya and her western allies (Adar, 2015). However, the lack of clear – cut stands on the issues of ICC and its proponents plays out in three ways as have been advanced by other studies inquiring into the Kenya – ICC relations. First, during the campaign of Uhuru Kenyatta in 2013, leading up to his assumption of the presidency, the African Report indicates that he hired a savvy public relations firm based in London – United Kingdom, which designed and spewed anti – western stands on social media. His procurement of a western firm while attacking the ICC as a western Court, displays his contradictions and lack of clear – cut stands towards the ICC (Obala, 2013).

Second, this contradiction and lack of clear

cut diplomatic stand is viewed in Kenyatta’s choice of defense team for his case at the ICC. Kenyatta views the ICC as a pro western institution, when he states in his speech at the 26th Extra – ordinary summit of the African Union (US 1) that “...out of over 30 cases before the court, none relates to a situation outside Africa. All the people indicted before that court, ever since its founding have been Africans.” It is generally expected therefore that he would rely on African institutions and it peoples for solutions. However, the lead counsel defending Uhuru Kenyatta at the ICC was Steven Kay, who is a Queens Counsel in the United Kingdom. He was assisted by Gillian Higgins and Benjamin Joyce, as can be confirmed in the Status Conference verbatim report (ICC, 2011). All these lawyers were white men hailing from the United Kingdom. Kenyatta’s choice of these lawyers, contradicts his contention with Western institutions including the ICC which he views as “white man’s” Court, keen on humiliating Africans.

Third, looking at the proposed economic policies of Kenyatta’s government as presented in the Jubilee manifesto, Obala (2013), underscores the need to look beyond what he refers to as “pseudo – nationalistic rhetoric of Uhuru’s administration”, since policies presented a regime that may be the most pro – western to rule the country since its independence. This vindicates the continuity and change in Kenyan foreign policy (Adar, 2015), and depicts contradiction in Kenyatta’s foreign policy choice towards the ICC. It can therefore be concluded that Kenyatta’s attack on the ICC and its western proponents, while implementing foreign policy geared towards cooperation with the same western proponent on different diplomatic issues besides the ICC; can be attributed to Kenyatta’s personality of low nationalism.

The three instances of contradiction in Kenya – ICC foreign policy, buttress the assumption that leaders low in nationalism define “we” and “them” or friends and foes, based on their interest in the prevailing diplomatic situation (Hermann, 2002). Kenyatta’s reliance on western institutions when it suits his interest, such as for public relations, personal defense and economic benefit; contradicts his attack on the ICC for being a western based organization. This portrays his shifty foreign policy choices on the Kenya – ICC relations.

UI 2 buttresses this conclusion. In the interview, Kenyatta clearly isolates the ICC issue from other diplomatic issues underpinning its relations with Germany. When asked whether he has discussed the matter of ICC with the German Chancellor – Angela Merkel; he responds;

“... No we didn’t discuss that particular issue....”

Excerpts from UI 2 – Interview with Daniel Pelz of DW News – DW African Desk
He goes further to explain to the journalist that;

“...Well, like I said this wasn’t necessarily the forum to do that and we are pushing and articulating our case very strongly through the State Parties and also through the Security Council which are the appropriate bodies for us to push our arguments and I am sure you are aware we have articulated our cases very clearly and our position with regard to the ICC and the need for it to reform very clearly and we shall continue to do so...”

Excerpts from UI 2 – Interview with Daniel Pelz of DW News – DW African Desk
In addition, Kenyatta’s low nationalism which is attributed to lack of steadfast foreign policy stands and the fluid nature of foreign policy choices explains his acceptance to attend the trials at the ICC in person, while at the same time attacking the Court. Despite his persistent attack of the ICC, and

soring of relations with the Court, Kenyatta attended the trial at the ICC, for it was the best diplomatic decision to make at that particular time. Lugano (2017), views this as strategic acceptance and strategic non – acceptance of the ICC. Both the diplomatic attack and attendance at the ICC were purely personal interest foreign policy options (Helfer & Showalter, 2017) associated with leader’s low in nationalism. This is made clearer by his utterances in US 2, when he explains that;

“...The African union, in its wisdom, resolved in October of last year that; to safeguard the constitutional order, stability and integrity of member states, no charges shall be commenced or continued before any international court or tribunal against any serving AU Head of State or government or anybody acting or entitled to act in such capacity during their terms in office... to protect the sovereignty of the Kenyan Republic, I now take the extraordinary and unprecedented step of invoking Article 147(3) of the Constitution. I will shortly issue the legal notice necessary to appoint hon. William Ruto, the Deputy President, as Acting President while I attend the Status Conference at The Hague in the Netherlands...”

Excerpt from US 2 – Address at the Joint Sitting of the Kenyan Parliament

From this speech, we witness the contradiction in Uhuru Kenyatta and his lack of clear-cut position on the case at the ICC, attributed to his low nationalism. During this speech he makes reference to the African Union resolution which he stood by, which is the discontinuation of his trial before the ICC, as this was the best diplomatic position during the African Union Summit. After making reference to the resolution, Kenyatta commits himself to attend trial at the ICC against the

African Union resolution. This shiftiness in the Kenyatta's foreign policy decisions explains Kenya's foreign policy towards the ICC between 2013 – 2017, and is underpinned by Uhuru Kenyatta's low nationalism.

The anti – ICC foreign policy behaviour of Uhuru Kenyatta faced opposition from domestic political opponents, (Lugano, 2017; Muller, 2013) who accepted the jurisdiction of the ICC in the country. In taming this opposition, and attacking the ICC, Kenyatta displayed preference for use of diplomatic channels. Evidence of letters by the Kenyan Permanent Representative at the UN, Ambassador Kamau Macharia addressed to the ICC State Parties and the UNSC vindicate this. Consequently, Kenyatta attended the 26th Extra – Ordinary African Union Summit, on 13th October, 2013, where he attacked the ICC and pressed for withdrawal of African states from the Court. This summit had been proposed by Kenya which secured the approval of two – third of African Union member required to hold the summit (Dersso, 2013). It was at the summit that Kenyan diplomatic officials led the charge for mass withdrawal of African Union members from the ICC. This foreign policy behavior is consequent of Kenyatta's low nationalism. Leaders low in nationalism prefer dealing with local opposition to their foreign policy options through collaborations such as summits, conferences and diplomatic gestures (Hermann, 1980). This is evident in UI 2 where Kenyatta reiterates that;

“... Well, like I said this wasn't necessarily the forum to do that and we are pushing and articulating our case very strongly through the State Parties and also through the Security Council which are the appropriate bodies for us to push our arguments and I am sure you are aware we have articulated our cases very clearly and our position

with regard to the ICC and the need for it to reform very clearly and we shall continue to do so...”

Excerpt from UI 2 – Interview with Daniel Pelz on DW News – DW African Desk

From his utterances, it is clear that Uhuru has confidence in UNSC and the ICC State Parties to solve their diplomatic debacle with the ICC. This behavior is attributed to his low nationalism as depicted in the results of the study.

Conclusion

In a nutshell, to analyze the foreign policy behaviour of Kenya towards the ICC between 2013 and 2017, it is imperative to look beyond the statist arguments of sovereignty and national honour. The focus should be on the president, as his office is bestowed with the responsibility of defining the country's foreign policy (Nzomo, 2016; Kaburu, 2020). Furthermore, the cases at the ICC were not against the Kenyan state, but were against the President of Kenya – Uhuru Kenyatta (Murithi, 2013), in this regard his personality influenced the strained Kenya – ICC relations.

Guided by LTA and using content analysis and profiler plus, this paper affirms that Uhuru Kenyatta is low in the nationalistic trait. The result on UU column in Table 4, depict the measure on nationalism of Uhuru Kenyatta at 0.2086 which is lower than that of the norming group by 0.1114. The result was an output of Profiler Plus analysis of five thousand eight hundred and fifty-three words. The low nationalism explains why the foreign policy behaviour of Kenya towards the ICC between 2013 and 2017 severed, in three key aspects. First, it vividly explains why Kenya did not cooperate with the ICC, which is based on Kenyatta's interest to maintain Kenya as a separate entity from the ICC. Second, it explains why there are contradictions and shifting goal posts in Kenya's foreign policy towards the

ICC, and towards other countries which Kenyatta regards as ICC patrons. Lastly, it explains why Kenyatta resorts to use diplomatic channels such as diplomatic letters, summits, and conferences when handling domestic rebellion against his foreign policy choices towards the ICC. All these actions are attributed to Kenyatta's low nationalism as explained using LTA (Hermann, 1980).

In undertaking foreign policy analysis, and while inquiring into foreign policy behaviour of states; researchers and policy makers should therefore often attempt to look into the personality traits of individual leaders and establish how such traits may have influenced foreign policy. By establishing leaders' personality traits, researchers and policy makers can predict the foreign policy behaviour of state under a leader. That is the significance of exploring personality trait in foreign policy analysis.

References

1. Adar, K. G. (2015). Foreign policy processes in African states. *Foreign policy analysis beyond North America*, 101-120.
2. Baum, C. W. (2015). *Nationalism in Unites States Foreign Policy in the Post-9/11 Era* (Doctoral dissertation, Portland State University).
3. Baxter, P., & Jack, S. (2008). Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. *The Qualitative Report*, 13(4), 544-556.
4. Brown, S., & Raddatz, R. (2014). Dire consequences or empty threats? Western pressure for peace, justice and democracy in Kenya. *Journal of Eastern African Studies*, 8(1), 43-62.
5. Dersso, S. *African Union Summit on the ICC—Extraordinary Solidarity of Elites*(Sep. 15, 2020), <http://solomondersso.wordpress.com/2013/10/12/the-trouble-with-african-leadership-solidarity-for-self-protection/> accessed on July 15, 2021
6. Duijker, H. C. J., & Frijda, N. H. (1960). *National character and national stereotypes: a trend report prepared for the International Union of Scientific Psychology* (Vol. 1). North-Holland Publishing Company.
7. Helfer, L. R., & Showalter, A. E. (2017). Opposing International Justice: Kenya's Integrated Backlash Strategy Against the ICC. *International Criminal Law Review*, 17(1), 1-46.
8. Hermann, Margaret G. "Explaining foreign policy behavior using the personal characteristics of political leaders." *International studies quarterly* 24, no. 1 (1980): 7-46.
9. Hodgins, S. (2015). Uhuru Kenyatta vs. The International Criminal Court: Narratives of Injustice & Solidarity.
10. Kaburu, M. (2020). Decision Making and Kenya's Foreign Policy Behaviour: The Moi and Kibaki Presidencies in Perspective. *Journal of Language, Technology & Entrepreneurship in Africa*, 11(1), 14-28.
11. Kendall, S. (2014). 'UhuRuto' and Other Leviathans: The International Criminal Court and the Kenyan Political Order. *African Journal of Legal Studies*, 7(3), 399-427
12. Kesgin, B. (2012). Tansu Çiller's Leadership Personality and Foreign Policy. *Perceptions*, 17(3), 29.
13. Khandal, P. (2018). Leadership Trait Analysis, Foreign Policy and Emerging Powers. (Doctoral dissertation, Leiden University).
14. Krippendorff, K. (2004). Reliability in content analysis. *Human communication research*, 30(3), 411-433.
15. Labuda, P. I. (2014). The International Criminal Court and Perceptions of Sovereignty, Colonialism and Pan-African Solidarity, *African Yearbook of International Law Online / Annuaire Africain de droit international Online*, 20(1), 289-321. doi: <https://doi.org/10.1163/22116176-90000149> accessed July 13, 2021.

16. Lambeth, L. (2010). Nationalism, Nationhood and Identity in Virtual Worlds and MMORPG's. *POLIS Journal*, 3.
17. Levine, N., & Young, M. (2014, August). Leadership trait analysis and threat assessment with profiler plus. In *Proceedings of ILC 2014 on 8th international Lisp conference* (pp. 50-59).
18. Lodge, M., & Taber, C. S. (2005). The automaticity of affect for political leaders, groups, and issues: An experimental test of the hot cognition hypothesis. *Political Psychology*, 26(3), 455-482
19. Lynch, G. (2014). Electing the 'alliance of the accused': the success of the Jubilee Alliance in Kenya's Rift Valley. *Journal of Eastern African Studies*, 8(1), 93-114.
20. Mueller, S. D. (2014). Kenya and the International Criminal Court (ICC): politics, the election and the law. *Journal of Eastern African Studies*, 8(1), 25-42.
21. Murithi, T. (2013). The African Union and the International Criminal Court: An Embattled Relationship?
22. Momodu, R. (2018). Nationalism Underpinned by Pan-Regionalism: African Foreign Policies in ECOWAS in An Era of Anti-Globalization. In *African Foreign Policies in International Institutions* (pp. 95-112). Palgrave Macmillan, New York
23. Mylonas, H., & Kuo, K. (2017). Nationalism and foreign policy. In *Oxford Research Encyclopedia of Politics*.
24. Miring'u, P. W. (2020). *The Persuasive Devices in William Ruto's Political Speeches a Relevance Theoretic Approach* (Doctoral dissertation).
25. Nzomo, M. (2016). Leadership and Statecraft in African Foreign Policy and Diplomatic Engagements. KG, Adar PL Loch and P. Inoti (eds.), *African Diplomacy and Leadership: Reflections of Diplomats and Scholars*, 99-166.
26. Obala, L. (2013). Kenya's 2013 Elections and Emerging Foreign Policy. *Al Jazeera Center for Studies*, 6.
27. Piston, W. G., & Hatcher, R. W. (2000). *Wilson's Creek: the second battle of the Civil War and the men who fought it*. Univ of North Carolina Press.
28. Suganami, H. (2009). Man, Culture and the Theory of International Relations. *International Relations*, 23(1), 149-154.
29. Wang, Qian. "Red songs and the main melody: Cultural nationalism and political propaganda in Chinese popular music." *Perfect Beat* 13, no. 2 (2012): 127.
30. Winter, S. G. (2003). Understanding dynamic capabilities. *Strategic management journal*, 24(10), 991-995.

English-Swahili as a Communication Strategy on the Facebook Social media platform Amongst Kenyans

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Abstract

The online sharing of knowledge and information in the World affects our social lives; the interpersonal relations as well as how we think and talk. Social media like Facebook, Twitter, Myspace, Skype, Orkut, and Face Time amongst others continue to grow and evolve extensively. Being an extremely powerful tool that is quick, efficient and effective in communication, how we decide to use it determines whether it turns out to be good or bad. Due to the anonymity nature of the participants, there is a tendency of bullying and negativity witnessed in some of the platforms for example, Facebook. This prompts some people to use code - switching between English and Swahili as a communication strategy to tone down on the offensiveness that may be evident in a certain trend of thought regarding some heated topics online. Using five of the communication strategy tenets, this paper therefore identifies and analyzes the various communication strategies depicted in the use of English - Swahili and their impact on the selected Kenyan Facebook pages. Analytical research design was used; data was purposively sampled from the major Facebook pages with topics that are open for discussion to the public to get the data. Analysis and discussion of instances, purpose and impact of switching from English to Swahili and vice versa to the whole trend of communication was done. English - Swahili as a communication strategy enhances convergence more than divergence in opinion and understanding through the shared language portrayed on the Kenyan Facebook pages.

Key words: Sheng; Communication Strategy; Facebook; Effective Communication.

Introduction

Communication plays a crucial role in bringing people together and strengthening the social ties. Language is one of the most important tools of communication. It provides the means to express and convey information, to learn about the people and the world around us. Man has evolved and innovated new ways to quench his thirst of interaction by creating ways of communication, ranging from the primitive language to advanced technologies like computer and mobile phones. The human craving for discovery, boundless connection and exchange of information and opinion with other users with the same interests may be prompting this expansion. Social media offers platforms for users to cross the boundaries of their countries to connect and express themselves at a global

level. Language is used conveniently to encourage more inclusivity of the ideas under discussion. This has prompted the need of looking at Code switching and code mixing of English – Swahili as a communication strategy on the Facebook platform amongst Kenyans.

Code Switching and Code mixing

Code-switching and code-mixing have been used interchangeably throughout literature. Hymes (1978) defines only code-switching as a common term for alternative use of two or more language, varieties of a language or even speech styles. Bokamba (1989) defines Code-switching as the mixing of words, phrases and sentences from two distinct grammatical (sub) systems across sentence boundaries within the same speech even whereas code-mixing is the

embedding of various linguistic units such as affixes (bound morphemes), words (unbound morphemes), phrases and clauses from a cooperative activity where the participants, in order to infer what is intended, must reconcile what they hear with what they understand.

Hasan, Abu-Krooz, Qasim, Al-zzawi, Majic and Sadoon (2019) explains that the term 'code-switching' refers to the juxtaposition of elements from two (or more) languages or dialects. According to them, there is, little agreement among scholars on either the semantic scope of the term as they use it, or the nature of distinctions to be drawn between it and other, related terms such as code mixing. The term 'code-mixing' is a fluid one that overlaps with 'code-switching'. Hasan et al. (ibid) explains further that switching and mixing may happen to a certain extent in speech of all two languages in a way that results in real confusion in relation to the two sociolinguistic terms. Thus, in this study, the two terms will not be defined to signify two very different patterns of code utilization but they will be looked at in terms of the communication strategy that is portrayed as they are being used in a trend of conversation on the Facebook platform amongst Kenyans.

In his approach to the motivation for switching Wardhaugh (2002) represents an essential factor in the code choice. He expresses issues like solidarity with listeners, choice of topic, and perceived social and cultural distance, which plays an important role in the speaker's choice. Gross (2000) argued that participants in interaction appear as "rational actors" who engage in code switching as an intentional act to achieve certain social ends. Furthermore, individuals negotiate positions of power through their linguistic choices. How they do this is not necessarily a conscious act, but what emerges from such interactions is a social hierarchy that depends on the interaction between them. This explains more the functions of code mixing and code switching in a conversation which is looked at in this paper as the communication strategies as they may enhance convergence of opinion more than divergence.

According to Meyerhoff (2006) people who speak more than one language, or who have command over more than one variety of any language, are generally very sensitive to the differences in the vitality of the languages they use. Moreover, they are equally aware that in some contexts one variety will serve their needs better than another. In this context, English-Swahili is used at various linguistics level to serve various needs of the interlocutors on the facebook page platform amongst Kenyans. Hence, this paper discusses instances of how English – Swahili is used during the discussion of controversial or sensitive topic to avoid the topic, abandon a message, replace meaning, and to cooperate as communication strategies (Faerch and Kasper, 1983).

Moreover, in the Kenyan context English – Swahili has been majorly linked to Sheng. However, sheng is a hybrid language that borrows from Kiswahili, English and other local languages (Abdulaziz and Osinde, 1997). Ogechi (2005) did a semantic study of Sheng, particularly looking at the lexicalization from Standard English and Kiswahili to a non-standard, peer language Sheng. On the other hand, Mwihaki (2007) addresses the status of Sheng' as a linguistic variety, presenting arguments for the conception of Sheng' as a social dialect of Kiswahili. The researcher explained further that this conception depends on the assumption that Sheng' speakers are prominent social categories that differentiate themselves through language use. The youth of Kenya seem to use Sheng' for the purpose of group identity, solidarity, and self-definition. Since then, so much has changed and keeps on changing with regard to the lexical structures of Sheng. This paper is discussing English – Swahili and vice versa as they are situationally used on the Facebook platform amongst Kenyans.

Social Media Overview

The regular media like TV, Radio and Newspaper allows only one-way communication, whereas social media gives a platform for interaction among users. The

term social media, functions as an umbrella term that includes internet - based sites and services that function for or promote social interactions between individuals that use them as an important part of their interpersonal communication (Page, Barton, Unger and Zappavign, 2014). Jimma (2017) explains that social media in its current form began its development in the 1980s, under the forms of bulletin board system (BBS), UseNet and Internet relay chat. The term social media refers to a range of tools that started to appear in the 1990s. One of the first sites that came out in 1995 was eBay followed by web log (blog) in 1997. However, services that would use these names first appeared in 1999 with the arrival of Live Journal and blogger.com.

The next seven years saw the rise of multiple services commonly used in the present, such as Wikipedia and Trip advisor in 2001, Skype and Word Press in 2003 and Facebook in 2004. In 2005, YouTube came to existence, and the following year a service named Twitter began to operate. Jimma (*ibid*) continues to discuss that since the arrival of eBay, social media gained many different forms and functions that aim to fulfill the types of services that the users seek such as forums, blogs, wikis, content sharing and virtual worlds. However, these are merely a few examples of all the different types of services that are available to users, as many social media services often merge forms or group them together. It is this inherent versatility that social media possesses that makes it so appealing to users. It is also the reason behind the daily increase of its clients.

Currently, social media is divided into three categories as discussed by (Cann, Dimitriou, & Hooley, 2011). When people use social media, they use the service that they require. First, the Communications category, which includes services such as Facebook, LinkedIn and Twitter, used by people to maintain connections and relations. If, on the other hand, people would feel the need to express themselves, they would use online journals, which are Blogs, such as Live Journal, WordPress and Blogger. Collaboration services are diverse, as they can serve multiple purposes, for example, Wikipedia or Wikis,

which is a site for any user to collect, add or edit content using a web browser. As a part of this category, there are also social news sites such as Newsvine and Reddit, which allow anyone that signs up for their services to spread news that what they feel are noteworthy. Finally, there are Multimedia services, which are often connected to entertainment services such as video sharing sites like YouTube and Vimeo. Streaming sites like Twitch which has users broadcast live content from their computers and podcast, are also included in this category. The final category of the Multimedia branch of social media is virtual worlds, which includes online video game playing. This paper falls in the category of communications category thus analyzing Facebook English-Swahili messages among Kenyans.

Facebook

Hall (2021) explains that Facebook was founded in 2004 by Mark Zuckerberg, Eduardo Saverin, Dustin Moskovit and Chris Hughes, all of whom were students at Harvard University. Facebook became the largest social network in the world, with nearly three billion users as of 2021, and about half that number were using Facebook every day. The company's headquarters are in Menlo Park, California. Access to Facebook is free of charge, and the company earns most of its money from advertisements on the website. Users can chat with each other and send each other private messages. Users can signal their approval of content on Facebook with the Like button, a feature that also appears on many other websites.

The research interest in Facebook is growing due to its increasing popularity and the possibilities it gives people of different cadres a platform to share information and learn from each other. Facebook remains the most popular social network, accounting for 71% of Internet users (Balakrishnan & Lay, 2016). According to Statistica.com, as per November 2021, Kenya has more than 8.7 million users, 34.5% being between the age of 18 to 34. This paper therefore, investigates the use of English

- Swahili as a communication strategy used on the Kenyan Facebook page to enhance convergence on issues that are of public interest.

Crystal (2005) claims that in the 21st century the use of the software applications had changed the way people communicate. Shortenings like abbreviations, acronyms, numeronyms, logograms and emoticons got their superiority over the language used in the social media. Ali (2012) noted that the increase in the number of the new English varieties, which appear under the Social Media influence, is a threat to the Standard English varieties. Moreover, many words have adopted new meanings because of social networking. For instance, nowadays it is widespread to use the word “friend” which is a noun –as a verb “to friend, to unfriend” or the word “google” which is also a noun –as a verb “to google” (Crystal, 2011). The word “friend” that is from Old English dating back to 13th century now has got a new meaning thanks to Facebook. It now means the process of accepting or refusing to be friends with someone. Alongside the changes in the meaning and as a speech part, the words have been shortened or by creating acronyms like BFF –Best Friends Forever; CU – See you; BT– By the way; YOLO – You Live Once; 2F4U – Too Fast for You and many more.

This paper therefore discusses English – Swahili as a Communication Strategy used on the Kenyan Facebook Social Media Platform to enhance convergence more than divergence in opinion and understanding through the shared language. This paper look at both English and Swahili language interchangeably at various linguistic levels, phonetically, morphologically, syntactically, semantically and even pragmatically.

Objectives

The objectives of this paper is to;

1. Identify the Communication strategies portrayed by the use of English - Swahili on the Facebook platform amongst Kenyans.

2. Evaluate whether the use of English-Swahili as a communication strategy enhances convergence more than divergence in opinion through the shared language portrayed on the Facebook platform amongst Kenyans.

Theoretical Background

Theoretical principles of communication strategies can be traced back to interlanguage studies and learner errors in early 1970s. Selinker (1972) introduced the notion of second language communication strategies in his seminar article entitled “Inter-language” in which he argued that learners’ insufficient knowledge of language and at the same time willingness to communicate leads to the use of communication strategies. This was the beginning of research on Communication strategies. Consequently, Corder (1981) suggested a working definition for communication strategies as: “systematic techniques employed by the speaker to express his meaning when faced with some difficulty”. The study of communication strategy became an interesting field to be explored by researchers like Canale and Swain (1980), Tarone (1981), Faerch and Kasper (1983), Bialystok (1990), Dornyei (1995) and Celce-Murcia (1995).

These researchers identified three components of communication strategies: problematcity, meaning that the person recognizes a communication problem; consciousness, meaning that the person is conscious of the problem and is consciously employing a strategy to resolve it; and intentionality, which implies that the person is able to choose between options for overcoming a communication problem. However, Bialystok (1990) pointed out that communication strategies may be employed by language learners when there has been no breakdown in communications (no problematcity) and that language learners typically use the same small set of strategies routinely, rather than

intentionally and consciously choosing to employ communications strategy.

Late 20th and early 21st century, the scholars of this field not only promoted the use of communication strategies, but they also defined the strategies (Dornyei & Scott, 1997; Faerch & Kasper, 1983; Rababah, 2003). Although they interpreted the communication strategies in different ways, the definitions were similar. Faerch and Kasper (1983) recognized communication strategies as a potentially conscious plan for solving what to an individual presents itself as a problem in reaching a particular communicative goal. They believed that the major types of communication strategies should be divided by human being's reduction and achievement behavior. The reduction behaviors changed the goal of expressing, and the achievement behaviors helped to develop an alternative plan to express original intended meaning (Faerch & Kasper, 1983).

According to Faerch and Kasper (1983), the reduction and achievement strategies offered functions of monitoring communication and simplifying the utterances for foreign language learners who were limited in their vocabulary and grammar application. The reduction strategies assisted learners to express meaning efficiently without lingering around a difficult topic or an arduous expression. Contrastingly, the achievement strategies assisted learners to apply the ideas of using inter-language and try to achieve intended meanings in English communication. This paper is not looking at the proficiency of speakers as to what sort of communicative goal they were able to accomplish by using Sheng. This paper discusses English - Swahili strategy as it is used on Facebook to enhance convergence more than divergence in opinion and understanding through the shared language. This was done using five strategies suggested by Faerch and Kasper (1983) such as: topic avoidance, message abandonment, meaning replacement, inter-language-based, and cooperation strategies.

Literature Review

This section has reviewed literature on the use of English – Swahili, language use on Facebook and researches done using the communication strategies. Various researches like Geia and Melo (2021), Yunis (2019), Slim and Hafedh (2019) amongst others has been reviewed.

Geia and Melo (2021) adopted a desk study reviewing studies related to Sheng language and its effect in Kenya. The research found out that Sheng is pervasive among Kenyan youths and they have adopted it as an identity marker. It is a variety that unifies them, creating in-group solidarity against outsiders. Moreover, Sheng had transcended socioeconomic class boundaries and is used by many youths irrespective of social class or gender. It is possible for a multilingual society to employ different languages in a diagglossic manner and have all of them co-existing and enriching one another as they function in their different contexts. When this is put into practice, then the spread of Sheng' will no longer be perceived as a threat to the phenomenology of its' speakers because the users will be able to balance its use and to integrate its values with those, they draw from other languages through language enriching process of multilingualism. Having this in mind this paper not only looks at the use of English – Swahili and vice versa as not a unifying language for the youth but for a wider age group. Nevertheless, it discusses it as communication strategy evident when English – Swahili is used to enhance convergence more than divergence in opinion on matters as they respond to them on a conversation on Facebook platform amongst Kenyans.

Yunis (2019) used qualitative methodology to explore the changes, which are imposed by soft media. The results and findings of the research work implemented at Khazar University among 60 respondents from different fields of study, age and gender, reveal that even though shortenings have a long history, nowadays, due to social media,

the usage of the shortenings has rapidly increased and brought a new style of spelling into the English language. He noted the usage of an immense number of neologisms, abbreviations, acronyms, numeronyms, logograms and emoticons are making their presence felt as old words get new meanings, shortenings pass from written language to oral, causing ambiguity. Basing on these findings, this paper discusses not just the ambiguity caused by the use of English - Swahili on Facebook platform amongst Kenyans, but explains the role it plays as a strategy to either enhance a specific thread of thought or distract it while discussing certain topics.

Slim and Hafedh (2019) explored the effects of Facebook-assisted teaching on learning English for specific purposes by students at the University of Tabuk, Saudi Arabia. Using a sample of 64 students from the Faculty of Business Administration, taking a Business Letters course in English, were divided into a Facebook-tutored group and a traditional classroom tutored group and were given the same vocabulary content. The two groups were given pre- and post-tests to measure their vocabulary learning, and were subjected to an interview to gauge their attitudes towards the instructional methods that were put to use. However, no significant difference between the two groups was found in terms of achievement in spite of the positive response and the high satisfaction level the Facebook-tutored students showed towards the use of such a platform. It follows that the possibilities offered by social media nowadays could also be linguistically rewarding for users, be they students or educators, as these media interactions are bound to take place either within the same linguistic communities or across different ones. Such options can give those users and language learners, in particular, the opportunity to practice with new texts and learn new vocabulary through interaction, especially if it extends over time. As regards educators, they can benefit from Facebook by using it as a platform to post different kinds of materials (texts, images, graphs, and video), to be worked upon, edited, added to and shared among their

students to attain intended objectives. Hence, the teaching experience can be more accessible and centered around students, as more room is given to learners to collaborate and an atmosphere of conviviality and creativity is enhanced among them (Selwyn, 2012). This study shows the possibilities of language use offered on Facebook in an organized school set up. Whereas the Kenyan social media platform deals with people of different characteristics and from different linguistic backgrounds who uses language in their own particular ways to discuss various issues as they arise. Hence the use of English - Swahili language that would ensure that interaction is enhanced as information is being shared amongst them.

Moreover, several studies have been done using the communication strategy theory. Most of which were looking at language proficiency and second language acquisition. For example, Faerch and Kasper (1980), Rababah (2003), and Masithoh, Fauziati, & Supriyadi, (2018) in their studies discussed how communication strategies are vital in communication in case an interlocutor is not well versed in a language he or she is using to communicate. This is also true for those who are learning a second language. Some of the strategies discussed are eminent in the current study though it doesn't focus on the language proficiency of either English or Swahili but it analyses how these strategies are portrayed by the use of either English and Swahili and vice versa by Kenyans on various public facebook pages.

Lin (2011) in her study identified the perceptions of learners at Taiwanese University on English as a Foreign Language (EFL) as well as the communication strategies as suggested translation strategies. It collected qualitative data about students' beliefs and attitudes as they learned communication strategies. The research question guiding the study was: What are Taiwanese University EFL learners' perceptions about learning communication strategies for translating Chinese contexts in mind into English? The findings showed that some strategies were important for enhancing communication especially where there was a problem of

getting the right word to convey an intended meaning. Nevertheless, some strategies like silence seemed more polite than using language in instances that the learner was not sure. Communication strategies as discussed by Lin (ibid) laid a good emphasis for this study. Though we did not focus on translation neither did we look at the language proficiency of the interlocutors, rather the study focused on how the communication strategies were used to enhance communication through convergence of opinion more than divergence.

Research Methodology

This was a library research where analytical research design was used. Data was purposively sampled from the major Facebook pages that exhibit happenings of our Kenyan society and the topics were open for discussion to the public. Data was solicited within the happenings of the year 2021. Discussions that used English - Swahili only were the ones that were collected and considered for analysis. Various topics and lines of discussion was extracted using an observation checklist that had features specific to topic avoidance, message abandonment, meaning replacement, Inter-language – based and cooperation strategies (Faerch and Kasper, 1983). Data collection stopped at the point of saturation (Patton, 1990). Using content analysis, the instances when the communication strategies were used were identified, their purpose and impact of switching from English to Swahili and vice versa to the whole trend of communication was analyzed and discussed.

Results and Discussion

In this section, the findings are discussed basing on the objectives. The Communication strategies portrayed by the use of English - Swahili were identified and evaluated as to whether they enhanced convergence more than divergence in opinion through the shared language portrayed on the Facebook platform amongst Kenyans.

For instance the communication exchange that was made on a question that was initiated

on *Glam my home page*:

X: *Kesi kama hii hupelekwa wapi? Jirani mmoja anacomplain that the other neighbor amejenga choo karibu na kisima chake (Julai 27, 2021)*

(Where do you report a case like this one? A neighbor is complaining that the other neighbor has constructed a toilet closer to his/her borehole)- Translation (T)

The answers from several people gave different opinions with regard to the question. This was purposively sampled and discussed as they portrayed different communication strategies as discussed below:

a) Topic avoidance

Tarone, Cohen and Dumas (1983) described topic avoidance as the attempt to totally evade communication about topics which require the use of target language rules or forms which the learner does not yet know very well. The speakers should move away from an interaction in which they had very little comprehension about the topics. That is, for achieving a purpose of effective communication, people contributing on a certain topic decide to use English - Swahili to seem to be giving information on the topic whereas in real sense they are avoiding the topic. Consider the following answer:

Y: *Can someone tell me the truth becoz am stuck on where to construct a kisima (borehole) becoz where I'd like chimba iko na choo (to construct has a toilet) which is temporary.*

Gross (2000) argued that participants in interaction appear as “rational actors” who engage in code switching as an intentional act to achieve certain social ends. In this case Y does not give X an answer, instead he avoids talking about it shifting from English to Swahili and vice versa to also show his dilemma with regard to the issue. He pretends to be in the same scenario and needs to be advised on how to go about it.

b) Message Abandonment

Faerch and Kasper (1983) explains this as the

second strategy in the reduction set. Tarone (1983) discusses message abandonment strategy focusing on when learners begin to talk about a concept but are unable to continue and stop in mid-utterance. In fact, this strategy advised that the learners should abandon their attempt to convey an intended expression if they judged that the intended meaning finally could not be expressed within their limited linguistic competence. In this study we are assuming issues on linguistic competence, the focus is in using Sheng as a strategy to abandon a particular line of thought. See the following statement:

A: *Mkicome (when you come) to conclusion mnishow nikuje kusoma (you tell me so that I come to read) comments.*

Several people who were contributing to this question seemed to be giving advises and judgements instead of answering the question asked. Due to the varied views 'A' abandons the message and asks to be told once they conclude the discussion so that she can come back and read the comments. Lin (2011) in her research discussed that message abandonment was a method that suggests my not to be obsessed in a difficult meaning. The interlocutor didn't need to take unnecessary pains to figure out a difficult meaning after he or she has decided to give up. Lin (ibid) believed that it was an efficient strategy in communication, especially an argumentative one. Though it may also halt a constructive communication.

c) Replacement Strategy

The last strategy is the reduction set that Faerch and Kasper (1983) also called it Semantic Avoidance Strategy. It indicated that the learners should alter a difficult intended message instead of totally abandoning expressing the message. Tarone et al. (1983) illustrated this strategy as the learner evades the communication of content for which the appropriate target language rules and forms are not available, by talking about related concepts which may presuppose the desired content. This involves changing a topic resulting in rather general or vague meanings with the context. Skills of replacing and borrowing meanings are used instead of

totally giving up expressing the intended meaning in a conversation. This can be seen in the following answer for the case above;

B: *Mwambie mchanga hupurify maji (Tell him that soil purifies water) – (T)*

C: *Hii ni septic (This is a septic) – (T)*

D: *Labda hata hiyo ni septic who knows (May be it is a septic who knows) – (T)*

In this case B, C and D are evading the question asked and changing the topic. C and D are even viewing the "kisima" as a septic tank wondering why such a question would arise. This is because the septic is filled from the "choo."

d) Interlanguage- based Strategy

Faerch and Kasper (1983) discussed the achievement strategies as well as compensatory strategies as a second set. They encouraged students to express their intended meaning concisely without abandoning their attempts of expressing it or leading to their intended meaning of a vague expression. This study discusses this strategy by considering the skills of generalization, paraphrase, word coinage, code switching, restructuring and non-linguistic strategies.

Generalization suggested a learner to use generalized inter-language words as substituted items to convey the intended meaning. For example, the term "Mwenye choo" and "Wakujenga choo" in this context have been used generally to mean the neighbour that the speaker is referring to.

Paraphrase means generating forms of descriptions, circumlocutions, and exemplification. Consider the following answers:

G: *Depends who did the construction first and whether mwenye choo was aware kama kuna kisima hapo, they might be new to each other.*

(Depends who did the construction first and whether the owner of the toilet was aware that the borehole was there, they might be new to each other) – (T)

H: *Did he tell his neighbours kuna kisima karibu*

(Did he tell his neighbours that there was a

dam nearby) – (T)

Here G and H are giving another description of the whole scenario. G looks at who did what first and if the neighbour knew about the ‘kisima.’ This to some extent is touching on their relationship as neighbours.

Word coinage and code switching as it’s evident in the conversation triggered by the above questions. “mwenye choo” and “wakujenga choo” are examples of words that have been coined to refer to the neighbour who had a toilet close to the borehole (kisima). Nevertheless, the whole issue of Sheng is simply code switching from English language to Swahili and vice versa as it is our main focus in this study.

Restructuring proposed that in the middle of interaction, learners might remove their difficulty and limitation by trying to structure different plans for intended difficult meaning in order to ensure the comprehensibility of the listeners. In other words, learners might reconstruct some easier expressions to illustrate a complicated meaning without reducing the intended meanings.

J: So saad iyo maji not healthy at

all 🙄🙄 Let her vacate kisima to another place woi she for the sake of her family’s health.

So saad that water not healthy at all—let her vacate the borehole to another place (feeling sad) for the sake of her family’s health) – (T)

J is scornfully using a facial emoji to restructure meaning given that whatever he was suggesting, the moving of the “kisima” to another place is rather impossible. She uses the emoji to show her disappointment that cannot be expressed explicitly by using words only (Cheng, 2017). Moreover, emojis make up for the lack of non-verbal cues like facial expressions, intonation and gestures on Social Media Communication.

e) Co-operation Strategy

The cooperation strategy as adopted in this study means that the speakers should signal to their interlocutors the need of sustaining communication instead of totally giving up an interaction (Tarone et al., 1983). In this

context the use of English - Swahili in itself is away of enhancing cooperation amongst the interlocutors. This is evident from the fact that once the speaker initiated a topic in English - Swahili then most of the people who contributed on that chain used English – Swahili language. Referring to C and D:

C: Hii ni septic

(This is Septic)

D: Labda hata hiyo ni septic who knows

(May be that is a septic who knows)

D is showing cooperation with C by affirming his observation that they may be thinking it is a borehole when in real sense it is a septic tank which is just in its rightful place, hence nothing to worry about.

Several other instances and topics had similar responses that portrayed these communication strategies. Though, this study only focused on how the strategies were portrayed through the use of English - Swahili. It was observed that once the initiator of any topic did so through English - Swahili, then most of the interlocutors commenting on it would use the same language. As much as some of them avoided tackling directly some of the topics the use of this language first showed a level of cooperation that can also be explained under the cooperative strategy. As observed by Meyerhoff (2006) people who speak more than one language, or who have command over more than one variety of any language, are generally very sensitive to the differences in the vitality of the languages they use. Moreover, they are equally aware that in some contexts one variety will serve their needs better than another.

Due to the vague answers and off topic answers that were being written by different people on this page, some abandoned the message. Others who seemed to know a lot about the subject gave diverse opinions that were still not answering the question of the initiator. Inter-language communication strategies like generalizations, restructuring and word coinage were also portrayed as people continued to comment on the issue. In some instances, emojis were being used as a way of restructuring what words could not have sufficiently expressed.

As much the interlocutors used various

communication strategies, they seemed to agree that it was a health hazard for a pit latrine to be dug close to a borehole. Moreover, neighbors need to maintain good relationship that would enhance communication to avoid such scenarios. Given it is on social media where some information cannot be authenticated some dismissed the thought of a borehole and brought in the issue of a septic tank, which should have not raised any issue. To say the least some gave a verdict on who did what first between the borehole and the toilet. From the above discussion, the use of English – Swahili as a communication strategy enhanced convergence of ideas and opinions more than divergence through the shared language portrayed on the Kenyan Facebook pages.

Conclusion

Issues like solidarity in a conversation, choice of topic, and perceived social and cultural distance, plays an important role in the choice of communication strategies. People who speak more than one language, or who have command over more than one variety of any language, are generally very sensitive to the differences in the vitality of the languages they use. They are equally aware that in some contexts one variety will serve their needs better than another. Hence, this paper discusses instances of how English – Swahili is used during the discussion of controversial or sensitive topic to avoid the topic, abandon, replace meaning, Inter-language – based strategy and cooperation strategies to enhance convergence of ideas and opinions more than divergence. Despite the assumptions made on the language proficiency of the interlocutors, the English and Swahili languages were being used interchangeably not just at the word level but also the sentence and meaning level portraying these communication strategies.

References

Abdulaziz, M. & Osinde, K. (1997). Sheng and English in Nairobi. *International Journal of the Sociology of Language* 125:1-21
 Abu-Krooz, H. H., Al-zzawi, O. Q. &

Saadon, M. M. (2019). Code Switching and Code Mixing: A Sociolinguistic study of Senegalese International Students in Iraqi Colleges

https://www.researchgate.net/publication/330225079_Code_Switching_and_Code_Mixing_A_Sociolinguistic_Study_of_Senegalese_International_Students_in_Iraqi_Colleges.

Ali, J.K.M. (2012). Influence of information and communication technology (ICT) on English language structure. *International Journal of Applied Linguistics and English Literature*, 4 (4), 108-117.

Bokamba, E. G. (1989). Are there Syntactic constraints on Code mixing? In *World Englishes* Vol. 8, pp. 277-293.

Cann, A. J., Dimitriou, K & Hooley. T (2011). *Social media: A Guide for Researchers*. Research Information Network, Web.

Cheng, L. (2017). Do I mean what I say and say what I mean? A cross cultural approach to the use of emoticons and emojis in CMC messages. *Fonseca J. Commun.* 15,199-217. doi: 10.14201/fjc201715199217

Crystal, D. (2005). *Language and Internet*. Cambridge. Cambridge University Press.

Crystal, D. (2011). *Internet Linguistics: A Student Guide*. Routledge.

Faerch, C., & Kasper, G. (1980). Processes and Strategies in Foreign Language Learning and Communication. *Interlanguage Studies Bulletin*, 5, 47-118.

Faerch, C., & Kasper, G. (1983a). Plans and strategies in foreign language learning and communication. In C. Faerch & G. Kasper (Eds.), *Strategies in Interlanguage Communication* (pp. 20-60). Longman.

Faerch, C., & Kasper, G. (1983b). *Strategies in Interlanguage Communication*. Longman

Geia, K., & Melo, H. (2021) Impact of Sheng Language in Kenya. *International Journal of Linguistics* 1 (1) 31-41. <https://www.iprjb.org/journals/index.php/IJL/article/view/1242>

Hall, M. (2021, November 9). Facebook. Encyclopedia Britannica. <https://www.britannica.com/topic/Facebook>

Halliday, M.A.K. (1978). *Language as Semiotic. Social Interpretation of Language and Meaning.*

Edward Arnold Publishing.

Jimma, J. D. (2017). Language of Social Media: Examination of English as a Lingua Franca in Social Media. University of Iceland, Department of English
file:///C:/Users/Dell/Documents/Language%20of%20social%20media,%20J%20J%20B3hann%20Dan%20C%20ADe1%20Jimma.pdf

Lin, C. G. (2011). Communication Strategies for Translations. Grace Hui-chin Lin.

Masithoh, H, Fauziati, E & Supriyadi, S. (2018). Communication Strategies used by Students on the Perspective of Language Proficiency

https://www.researchgate.net/publication/327991960_Communication_Strategies_Used_by_the_Students_on_the_Perspective_of_Language_Proficiency

Meyerhoff, M. (2006). *Introducing Sociolinguistics.* Routledge Publishing.

Mwihaki, A. (2007) Viewing Sheng as a Social Dialect: A Linguistic Approach. *Chemchemi; International Journal of the School of Humanities & Social Sciences Vol. 4: No. 2, 57-75.*

Page, R., Barton, D., Unger, W. J. & Zappavigna, M. (2014). *Researching Language and Social Media: A Student Guide.*

https://www.researchgate.net/publication/282337000_Researching_Language_and_Social_Media_A_Student_Guide

Patton, M. Q. (1990). *Qualitative evaluation and research methods.* Sage Publications.

Rababah, G. (2003). Communication and linguistic problems facing Arab learners of English. *Indian Journal of Applied Linguistic, 29, 123-142.*

Tarone, E. (1983). Some thoughts on the notion of 'Communication Strategy.' In C. Faerch & G. Kasper (Eds.), *Strategies in Interlanguage Communication (pp. 61-74).* Longman

Tarone, E., Cohen, A. D., & Dumas, G. (1983). A closer look at some interlanguage terminology: *A framework for communication strategies.* In C. Faerch, & G. Kasper (Eds.), *Strategies in interlanguage communication (pp. 4-14).* Longman

Vygotsky, L. S. (1987). *Thought and language.* MIT Press

Wardhaugh, R. (2002). *An Introduction to Linguistics.* (4th ed). Blackwell Publishers.

Yunis, M. A. (2019). Language of Social Media: An Investigation of the Changes that Soft Media has Imposed on Language use. 9th International Research Conference on Education, Language and Literature (IRCEELT) Tbilisi/Georgia May 3-4, 2019

https://www.researchgate.net/publication/336717574_LANGUAGE_OF_SOCIAL_MEDIA_AN_INVESTIGATION_OF_THE_CHANGES_THAT_SOFT_MEDIA_HAS_IMPOSED_ON_LANGUAGE_USE

Predictors of Revenue Management Practices in Star-Rated Hotels in Kenya

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Abstract

The study sought to uncover predictors of revenue management (R.M.) practices in Kenya's star-rated hotels. A quantitative method was embraced for the study, while a census survey design was used. The research targeted financial controllers and sampled the whole population at Kenyan star-rated hotels registered with the Tourism Regulatory Authority of Kenya year 2020. The survey received a response from 137 financial controllers. Self-administered questionnaires were used to collect data. The results revealed that predictors affect R.M. practices in Kenyan hotels. Further, a significant relationship between predictors and revenue management practices was established through structural equation modeling. The results indicated that predictors explain variation in R.M. practices where R.M. techniques (26.2%), R.M. policy and implementation (25.6%), Pricing techniques (18.3%), R.M. team (38.5%), R.M. social media integration (42.9%), and non-pricing techniques (28.5%). The model results chi-square=114.59 (102df) p=0.054 CFI=.965 RMSEA=.0389 NFI=.959 indicating that the model fit or the data was acceptable. Although this is one of the studies investigating the predictors of R.M. is the fastest growing economy in Africa, its results are founded on an analysis of one projecting hospitality region in the Eastern region of Africa. The study adds to the empirical information for conceptualizing and describing key predictors of R.M. practices in hotel businesses. The paper is critical because such hospitality businesses are drivers of economic development. Nonetheless, the results provide primary evidence for industry specialists and policymakers to critically examine how to mitigate the adverse effects of predictors to achieve a positive contribution to revenue maximization.

Keywords: Hotels, predictors, Star-rated, Kenya, Revenue Management Practices, Financial controllers

Background to the study

The yearly research on the social and economic impacts of the hotel industry, which has been conducted for the past 25 years, reveals that the global hotel industry, which is a subset of the more critical tourism and travel industry, added \$ 8.8 trillion to the global economy in 2018 (WTTC, 2020). The hotel sector is an important economic engine in Africa, accounting for 8.5 percent of GDP in 2018, or \$194.2 billion, increasing from 8.1 percent in 2017 and 7.8 percent in 2016 (Jumia-Hospitality, 2019). The tourist sector

has grown important to African economies during the last two decades. In 2019, the industry accounted for over 7% of Africa's GDP and contributed \$169 billion to the continent's economy—roughly the GDP of Côte d'Ivoire and Kenya combined (Monnier, 2021). The hotel sector is an essential engine of the Kenyan economy, as seen by its ongoing contribution to GDP, which climbed from 14.4 percent to 16.6 percent between 2017 and 2018 (Kenya-National-Bureau-of-Statistics, 2020).

The hotel industry has approximately 225 rated hotels ranging from one to five stars, with about 16,156 sellable rooms with a capacity of 26,786 sellable beds; there are currently approximately 16,156 sellable rooms available, with a total capacity of 26,786 beds, a 3% increase from 2011 (TRA, 2020). Between 2011 and 2015, Kenya's hotel industry saw a decrease in room revenue, with an occupancy rate of 34.4 percent, compared to other countries in Africa averaging 59.4 percent and European and American markets with more than 65.5 percent (Cytton, 2017; KNBS, 2020).

According to statistics from the Census and Economic Information Center (CIEC) and the Kenya National Bureau of Statistics (KNBS), the occupancy rate of Kenyan hotels is below average and varies widely even across different regions within the country. For example, from 2002 to 2016, the average growth rates for Coastal Beach 43.0 percent; Nairobi High Class 40.5 percent; Central region averaged 27.050 percent, Maasai Land averaged 39.000 percent, Nyanza Basin averaged 26.0 percent, Western averaged 26.0 percent, and Northern averaged 23.0 percent (CIEC, 2020).

In contrast, Kenyan hotels have been registering low occupancies, but the number of sellable hotel rooms has been growing and slowly increasing over the years. At times occupancy rates may decline by 80% (Irandu, 2006). Price and location are two essential elements that influence hotel occupancy rates, but there are many more, such as the guest experience, the cleanliness and quality of the rooms, and the availability of amenities (Hamzehzadeh, 2017). The Kenyan hotel industry is resistant to change and sluggish to adopt new ideas; they need a compelling rationale to invest in new and inventive ways of doing comparable functions (Miricho, 2013; Murimi & Wadongo, 2021). Adopting innovative concepts in Kenyan hotels comes with several difficulties and is heavily influenced by external pressure (Kilali, 2016).

Predictors of R.M. will continue to wreak havoc on Kenya's hotel industry, robbing hotels of consistent occupancies and opportunities to increase room prices and revenues. Despite widespread claims and improvements in Revenue Management (R.M.) practices, empirical research on predictors and their correlations to R.M. practices in the Kenyan hospitality industry context are scarce. The study attempts to fill gaps and expand current understanding by giving empirical evidence on determinants of R.M. practices in Kenya. Researchers have confirmed a relationship between predictors and the performance of organizations (Ferreira & Otley, 2010; Santoro, 2015; Speckbacher & Offenberger, 2010; Wadongo, 2014). Finally, this work replies to past calls for more incredible research into the predictors influencing hotel performances (Hernandez, 2015; Ortega, 2016).

Hotel predictors considered in this study have been adopted from frameworks by (Agiomirgianakis, Magoutas, & Sfakianakis, 2012; Kaminski & Smith, 2016; Abrate & Viglia 2016; Soohyang, Hee-Chan, & Seul, 2016). These include star rating, location, number of guest rooms, market orientation, seasonality, technology changes, environmental uncertainty, environmental complexity, and environmental dynamism. Star-rating; the number of stars assigned to a product strongly correlates with revenue per available room (RevPAR) (Sainaghi 2011). A database of rated chain hotels is more effective at increasing occupancy than realizing higher fees when appropriate revenue systems are implemented (Ortega, 2016). Becerra, Santaló, and Silva (2013) conducted a study based on the impact on prices and concluded that the star rating and the fact that they are part of a hotel chain allowed hotels to charge higher prices and offer fewer discounts, confirming stronger positive linkages between the number of stars and prices.

The hotel is a location, and its set costs have long-term repercussions for its success (Baum & Mezas, 1992). "The hotel industry frequently claims that the three most key predictors in the success of restaurants and similar companies are locations, location, and location" (Baum & Mezas, 1992, p. 585). According to Sainaghi (2011), its central location increases its RevPAR approximate worth. In addition, (Sainaghi 2011) investigated the "where" and "what" aspects with 72 respondents from 3 to 5-star hotels. According to financial surveys and summaries, the "what" is defined by four principles: the total rooms in a hotel, the number of employees, and the time after refurbishment, and market orientation, while the "where" emphasizes the importance of the location, particularly the hotel's central location within the destination. The hotel's location bears on its performance (Xiaowen, Xin, Kai, & Zhijian, 2013). According to agglomeration theory, locations adjacent to competitors might benefit from increased demand, frequent consumer visits, and successive purchases by lowering customer search costs (Tsang & Yip, 2009).

The guest rooms and RevPAR have an inverse relationship (Sainaghi, 2011). In addition, the number of personnel in a hotel has a substantial impact on their productivity. Employees typically add value to occupancy or the worth of a property, resulting in a considerable impact on RevPAR (Sainaghi, 2011). The size of a hotel in terms of rooms has a considerable impact on revenue management decisions. However, there is no connection with revenue management (Xiaowen et al., 2013). Previous research has suggested that a company's size significantly impacts performance and scale efficiencies (Sainaghi, 2011).

Nonetheless, "size frequently captures the existence of economies of scale and the prevalence of diseconomies because of advanced management and business expenses" (Anastassopoulos, Filippaios, &

Phillips, 2009, p. 191). Founding factors have a strong relationship with REVPAR. When new hotel upgrades need time to be noticed and provide positive results, time slack substantially impacts RevPAR (Sainaghi, 2011).

Market orientation is described as a collection of processes involving all departments focused on the market in an organization (Shapiro, 1988). Marketing professionals commonly use "market orientation" to describe how well a company applies the "marketing concept." On the other hand, the marketing philosophy holds that recognizing target clients' needs and providing the necessary satisfactions better than competitors is significant towards achieving organizational aims like market share and profitability. Agarwal, Krishna Erramilli, and Dev (2003) expound that the business market orientation immediately impacts innovation, which improves judgmental and objective performance. Sampaio, Hernández-Mogollón, and Rodrigues (2019) investigated the linkage of market orientation on the performance of the hotel sector and discovered that market orientation significantly affected the performance of the business. According to the study, the direct association between market orientation and RevPAR "produces a degree of explained variance of 65 percent" according to the study (Jeffrey & Barden, 2000a, p. 185). More research employing comparable models (Jeffrey & Barden, 2000b) confirmed the same results as the previous study (Sainaghi 2011). There was a scarcity of market orientation empirical research in the services industry, and there is currently a scarcity in the hospitality industry, especially compared to other economic divisions (Sampaio et al., 2019). A hedonic price model was created and adopted to measure pricing by modifying hotel attributes and amenities.

On the other hand, the residuals' spatial inquiries may be able to deduce the rates of rooms not revealed by the model (Pawlicz & Napierala, 2017). Furthermore, databanks of

Online Travel Mediators and star assessments demonstrate that hotel star ratings affect pricing, with each additional star rate providing 25-36 percent significance to prices. Few studies have explored star rating, location, number of rooms, market orientation, and guest room prices on revenue management practices; hence, this study is needed.

Seasonality is a time-based phenomenon in the hotel industry usually measured by the number of clients, bookings, guest expenditures, mode of transportation, occupation entries, and web request traffic (Butler, 2001). Seasonality affects each hotel differently (O'Mahony, Galloway, Bergin-Seers, Lee, & McMurray, 2008). Due to misshaped schemes that cause alternate ways of consuming items in the tourism and hospitality business (Chiutsi & Mudzengi, 2017), seasonality has inevitable repercussions on hotel performance (Chung, 2009). The link between seasonality as a predictor of revenue management practices has not been fully explored, necessitating further research.

Changes in technology necessitate gathering and analyzing data for managers' use (Le Torc'h, 2013). Hotels should automate their processes to improve organizational efficiency because it results in a 37.0 percent change (Kimes, 2010). Micros frameworks, mainly Fidelio package suite 8, are used by most hotels to manage their properties. This type of system encourages revenue management tools like dynamic pricing frameworks that are excited about occupancy rates. On the other hand, the technology has not provided demand predictions (Mayer, 2014). Despite its significance, there is a paucity of literature on the subject. As a result, it is vital to do empirical research on technical advancements in R.M. practices.

Guadix, Cortés, Onieva, and Muuzuri (2010) investigated the involvement of new technology in developing revenue management strategies; the finding reveals that each improvement in technology

management leads to more complex revenue management skills. Occupancy, efficiency, and yield were among the performance indicators examined. By testing against actual data, the system improved its applicability for real-world scenarios, resulting in an efficient and innovative solution for managing hotel reservation systems.

The hotel sector is characterized by a long era of susceptibility, instability, economic unpredictability, political unpredictability, fear-based oppression, and pandemics (Oaten, Le Quesne, Segal, & LLP, 2015). The extent of environmental uncertainty is the speed and rate at which an organization's condition within the environment is changing (Awang, Ishak, Mohd-Radzi, Taha, 2008). By integrating six primary metrics, several elements can explain the uncertainty in the hotel industry: demand for guest rooms; changes in guest room rates; regulatory service changes; labor accessibility and changes; changes in competitors' strategies; clients' likes and preferences (Awang et al., 2008).

The rate of change in the business environment substantially influences the performance of hotels (Awang et al., 2008). Furthermore, pricing charged by competitors, unpredictability in price adjustments by suppliers, opportunities for business capital and finance, demand curve, labor supply, market activities of new business competitors, and the impact of current technologies all contribute to the hotel sector's volatility (Olsen, Tse & West, 1992). While this is frequently the case, it is critical to determine whether uncertainty is a predictor of revenue management practices in hotels.

The degree of variety within the organizational environment is called environmental complexity (Awang et al., 2008). Furthermore, because it governs lean tasks and buying in businesses, environmental complexity positively impacts organizational performance (Azadegan, Patel, Zangouinezhad, & Linderman, 2013). Six

indicators can be used to assess the hotel industry's complexity: extensive competitor convergence, a general grouping of sector sales, centralization of clients, services and product differences, centralization of labor accessibility, and technological approaches within the firm (Awang et al., 2008). While it is understandable that environmental complexity impacts a company's performance, this has not been adequately examined in Kenya's hotel sector (Njoroge, Kinuu, Ongeti & Kasomi, 2016). As a result, it is critical to determine if any environmental complexity is a predictor of R.M. practices in hotels.

The rate at which a customer's preferences and the hotel's offerings vary over time is known as environmental dynamism (Wijbenga & Van-Witteloostuijn, 2007). Environmental dynamism refers to the external business environment's volatility and unpredictability (Li & Liu, 2014). Technological changes, market changes, clients, competition, competition unpredictability, change pace, and consumer behavior uncertainty are used to assess environmental dynamism (Wang, Senaratne, & Rafiq, 2015). Environmental dynamism substantially affects organizational performance (Akgün, Keskin, & Byrne, 2008). The frequency and severity of the caused organizational changes are the two metrics for environmental dynamism (Mohd, Idris, & Momani, 2013).

Few types of research have been conducted to investigate whether environmental dynamism is a predictor of R.M. practices in hotels. Seasonality, an uncertain market, economic conditions, competition, and internal hotel drivers may obstruct the performance of hotels. Like JDA Software and Stay Night Automated Pricing (SNAP), new technological tools are now employed by hoteliers to increase income and stay ahead of the competition. As a result, it is necessary to investigate the predictors like seasonality, technological changes, environmental complexity, uncertainty factors, and

environmental dynamism influence R.M. practices in Kenyan hotels.

Revenue management practices in hotels

Revenue management is a strategic tool that seeks to maximize profit margin by adjusting the prices for which limited products, such as hotel rooms, are made accessible for sale concerning current and anticipated demand (Hospitality-Professionals-Association, 2013). R.M.'s incorporation into the hospitality industry has improved hotel productivity and competitiveness and provided hotels & restaurants with increased profits (Ferguson & Smith, 2014). R.M. will use a consistent strategy to maximize profits by increasing a hotel's potential strength (González-Serrano & Talón-Ballester, 2020). In general, R.M. is defined as the study of examining demand while simultaneously modifying the price and availability of products to correspond with that specific demand (Queenan, Ferguson & Stratman, 2011). The initial hotel RMS for the hospitality sector mimicked the airline sector by analyzing past data and forecasting future booking trends (Cross, Higbie & Cross, 2011). Forecasting booking habits was adopted for different sectors such as fast-food places, spas, bars, and leisure parks, initiating the planning and enforcement of R.M. protocols (Anderson & Xie, 2010; Le Torc'h, 2015). Since 2000, most hospitality businesses had officially started to rely on R.M. systems heavily. Marriott, Hilton, Sheraton, Starwood, and InterContinental were among the first hoteliers to use R.M. (Kimes, 2003). The hospitality industry identified the value of implementing the R.M. strategy as applied by the airline industry. However, the procedure's development was initially hampered by a lack of suitable techniques to manage documentation and a shortage of visitor data (Hospitality-Professionals-Association, 2013). Hotels using a revenue management system (RMS) easily surpass non-RMS users in the face of falling demand; RMS is more

successful in increasing occupancy (Ortega, 2016).

In today's hotel management, academia and practitioners in the industry have agreed that viable revenue management is a must-have for success (Noh, Lee & Lee, 2016). The generation of additional revenues is attributed to effective revenue management policies and implementation. When properly implemented, revenue management generates 33 percent more revenue than traditional restaurant methods (Karmarkar & Dutta, 2011). When properly implemented, RMS has been shown to generate a 5-10% increase in sales and enhance occupancy rates throughout the low season in the business succession (Morag, 2013). Restaurant revenue management data from an Atlanta, Georgia restaurant (Bertsimas & Popescu, 2003) discovered that adopting sophisticated revenue management models increased revenues from 3.5 percent to 7.3 percent, likened to old-style first-come-first-served models. As a result, revenue management is divided into three stages: revenue management policy proposals, application, revenue management techniques, and revenue control systems (Murimi et al., 2021). The phases include adopting and implementing R.M. policies in hotels; then, R.M. techniques entail identifying and defining critical revenue management spheres and determinants. Several techniques include analyzing historical information, forecasting future booking patterns, demand forecasting, customer segmentation, capacity management, pricing practices, time control, R.M. controls, capacity control, pricing management, R.M. target, menu management strategies, and R.M. data collection methods. RMS practices include information flow systems, RMS dynamism, RMS strength, and revenue information use. Several factors influence hotel revenue management practices; for example, the intricacy and specificity of the RMS will vary by hotel. The accelerated establishment and development of

technological tools, such as social networks and digital channels, also affect how R.M. is practiced in the hospitality industry (Noone, McGuire, & Rohlf, 2011). Technological progress enables the creation of a favorable environment for R.M. (Morag, 2013). With existing products and customer sets, advances in complex pricing and revenue management techniques have added more money to the bottom lines of many firms (Cross et al., 2011). The reviewed literature review highlights the summarized expansive nature of R.M. practices and their contribution to the economic success of the hotel industry. However, there is very little empirical evidence on the factors influencing R.M. practices in Kenyan hotels.

Methodology

A census survey design was used in this study. This study concentrated on Kenya's classified hotels. The star rating is one to five stars, and the establishments can be found throughout Kenya. These hotels are well-established and continue to control a diverse range of market segments. The star-rated establishments were chosen for their extensive set of policies and procedures. Because of the scope of operational activities, star-rated hotels can use strategies deemed more affluent than non-classified hotels (Odawa, 2017). The study's units were the 225 star-rated hotels designated star-rated establishments' cluster in Kenya (TRA, 2020). Financial controllers of hotels were the respondents for this study. The responders are experts because they play a crucial role in the hotel's revenue organizational processes. Each star-rated hotel had one (1) respondent, for a total of 225 respondents in the poll. Respondents' information was gathered using a questionnaire. The researchers conducted a literature review for the questionnaire and adopted and modified previous related literature to examine the predictors better. Data were descriptively and Inferentially, using IBM SPSS AND AMOS Version 27.

While the presentation of the data was done using figures, charts, and tables.

Findings and Discussions

The total valid respondents were 137, yielding a 60.89 percent usable response rate. The response rate by region is summarized in Table 1. The Nairobi region has the highest frequency, with 44.5 percent responses, followed by the western region with 15.3 percent, the coast region with 11.7 percent, and the central region with 10.2 percent. The Eastern region received the slightest response. The Nairobi region has the most star-rated facilities, while the Eastern region has the fewest. See table 1—response per region on the attached manuscript.

The majority of responses (31.4%) were for three-star hotels, followed by four-star hotels (28.5%) and two-star hotels (27%). Only 12.4 percent and 0.7 percent for five-star and one-star hotels, respectively, as shown in figure 1 on bar charts representing hotel star rating on the attached manuscript. Figure 2 A pie chart showing the hotel location shows that 78.1 percent of the hotels are in urban areas, while 11.7 percent are in the semi-urban areas and 10.2 percent in rural regions.

The summary of the responses reflected in figure 3, a pie chart showing the belonging of the hotel, indicates that 77.4 percent of star-rated hotels are independent, only 22.6 percent are chain associated. The summary of the bar chart figure 4 shows how long the hotels have been in existence; only 9.5 percent of hotels are less than five years old, majority while 15.3 percent are over 21 years old. Of most star-rated hotels, about 74.2 percent have been in existence for 6-20 years.

Figure 5 portrays that 75.2 percent of hotels have been refurbished within the last five years. While 15.3 percent did refurbishment 6-10 years ago, about 9.5% did it 11-15 years ago. No hotel registered refurbishment for longer than 15 years since establishment. Figure 6 shows the number of available rooms in hotels, indicating that 36.5 percent have 1 to 50 rooms and 37.2 percent between 50-100

rooms. The hotels with over 300 rooms are very few, just 1.5 percent. Other categories, 101-150 rooms; about 8.8 percent, 151-200 rooms; about 8.0 percent, 201-250; about 5.1 percent while 251-300 rooms; about 2.9 percent.

Table 2 shows room prices and market orientation. For example, hotels have high and low seasons. More than half of hotels have both local and foreign prices for their clients. It is related to the nature of the services and the global consumer target market. Most hotels have set prices until the following review, and they vary depending on the market. The rooms are set up with varying discounts for different market segments discovered. Hotels cut their prices when occupancy is low. The hotel's focus is on customers and addressing their requirements. There is a process of acquiring information and quickly communicating it to clients to satisfy their preferences. The finding supports that market orientation significantly the performance of the business (Agarwal et al., 2003; Sampaio et al., 2019)

The means for seasonality changes and technology advancements are shown in Table 3 on seasonality and changes in technology and how they have influenced hotels. Changes in seasonality were also discovered to have an impact on hotels. The hotel has low and high seasons ($M=3.99$, $SD=.907$). Also, seasonal fluctuations in clientele did not affect hotels ($M=4.18$, $SD=.815$). Further research reveals that hotels can forecast seasonal changes ($M=3.90$, $SD=.789$). Overall, seasonal fluctuations significantly impact hotel bookings and reservations ($M=3.33$, $SD=1.362$). The findings support the finding that seasonality affects each hotel differently (O'Mahony et al., 2008). Further, it has inevitable repercussions on hotel revenue growth and performance (Chiutsi & Mudzengi, 2017; Chung, 2009). According to the results of technological changes, hotels have implemented technical advances in their operations ($M=4.31$, $SD=2.66$), and these

innovations have improved operations (M=3.97, SD=.757). Technological advancements are crucial in information collection (M=3.83, SD=.854), following pricing (M=3.82, SD=.842), predicting (M=3.82, SD=.901), and have boosted hotel efficiency (M=3.88, SD=1.025). The results affirm that the involvement of new technology improves its applicability for real-world scenarios, resulting in an efficient and innovative solution for managing hotel reservation systems through R.M. strategies (Guadix et al., 2010). Further, technological advancements create an encouraging environment for R.M. (Morag, 2013).

The study's findings in table 4 environmental complexity demonstrated that environmental complexity elements significantly impacted hotel operations. This category considers the concentration of competitors within the business location (M=2.75, SD=.511) and the geographic concentration of target customers (M=2.75, SD=.543). Labor availability (M=2.39, SD=.546), product and/or service variety (M=2.60, SD=.562) the hotel's position (M=2.80, SD=.456). Changes in guest room rates (M=2.48, SD=.583), changes in labor availability (M=2.14, SD=.583), changes in demand for guest rooms (M=2.88, SD=.373), and changes in competitive tactics used by competitors (M=2.55, SD=.605) were identified as uncertainty factors that are likely to affect hotel operations. Changes in regulatory service and activities (M=2.35, SD=.589), changes in consumer service and preferences (M=2.47, SD=.569), pandemic fear, and market structures (M=2.35, SD=.589). The findings affirm that the hotel industry is characterized by a long era of susceptibility, instability, economic unpredictability, political unpredictability, fear-based oppression, and pandemics (Awang et al., 2008; Oaten et al., 2015).

Revenue management practices in hotels in

Kenya

The findings revealed some extent of revenue management practices in star-rated establishments (M=2.96, SD=.989). 40.9% of hotels have wholly actualized R.M. practices. The findings revealed that R.M. is practiced to envisage the development of hotels (M=3.47, SD=.916), reduces operation costs (M=3.50, SD=.994), enhances yield (M=3.50, SD=.841), and creates revenue (M=3.67, SD=1.072). Further, the respondent had some capability on R.M. skills (M=2.61, SD=.894). The results uphold that revenue management generates more revenue than traditional restaurant methods (Karmarkar & Dutta, 2011).

The findings on the summary table 6 R.M. practices established that hotels use R.M. policies (M=3.45, SD=.985) and have hired R.M. implementers (M=3.47, SD=.993). The hotels' R.M. teams can handle R.M. challenges (M=3.69, SD=.999). There is the integration of information technology with R.M. practices (M=4.26, SD=.993). R.M. information is readily available to guests (M=4.42 SD=1.241). Use of pricing tools (M=4.20 SD=.976). Use of non-pricing tools (M=4.58 SD=1.160). The summary reveals some R.M. activities are happening in the Kenyan hotel industry though only 40% of hotels have fully actualized R.M. practices which could be attributed to adverse effects of the predictors mentioned above. To manage revenues, most hotels use non-pricing tools like room availability guarantee, capacity management, control of the length of stay, and management of overbookings. The results affirm that channel management and internal hotel mechanisms are still being used to manage revenue (Koide & Ishii, 2005; Ivanov & Zhechev, 2012).

The association between predictors and R.M. practices

This study finds a linkage between several predictor variables and revenue management practices aspects. The standardized regression

weights (Beta) and two-tailed significance levels (p) in figure 6 and table 7 show the results of the significant predictors of revenue management practices as R.M. techniques, R.M. data and information, R.M. policy and implementation, R.M. team, R.M. social media integration, R.M. pricing techniques and R.M. non-pricing techniques. The results indicate that predictors explain variation determinants explain a variation in R.M. practices as follows, R.M. techniques (29.2%), R.M. policy and implementation (36.5%), Pricing techniques (23.9%), R.M. team (29.4%), R.M. social media integration (28.8%), non-pricing techniques (19.9%) and R.M. data and information (41.1%). The model results chi-square=114.59 (102df) $p=0.054$ CFI=.965 RMSEA=.0389 NFI=.959 indicating that the model fit or the data was acceptable (Arbuckle, 2020).

Conclusion and Implication of the Study

This study aimed to look at the essentials that impact the revenue management practices of star-rated hotels in Kenya and further establish the correlations between those elements and various aspects of R.M. practices. As it appears, these elements are broad and involve both internal and external aspects of hotel businesses. Star-rated hotels in Kenya are an essential aspect of the country's economic development. As a result, their contribution to the hospitality industry makes them flourish and remain competitive, which is critical to the progress and expansion of the sector. Given the vital role they play in the progression of economic development, external and internal drivers must be investigated to find out how they affect R.M. practices. This analysis emphasizes that, while parameters associated with hotel R.M. practices vary, their underlying dynamics are unknown. There is a need to enhance the research on these characteristics because they affect the hotel industry and are critical to its economic development. One of the paper's more significant contributions is opening these research paths in future studies. Certain obstacles encountered while conducting the

study may potentially aid as a guide for forthcoming research attempts. Some of them include; discovering creative strategies to enhance the respondents and involvement rate of hotels in the data collection process. Upsurge local and regional representation of non-classified hotels and expand future research projects to other countries, especially in Africa. Lastly, start collecting longitudinal observations of measurable pointers, which will allow for the advancement of underlying econometric models.

List of Abbreviations

KNBS	Kenya National Bureau of Statistics
REVPAR	Revenue per Available Room
RMS	Revenue Management System
TRA	Tourism Regulatory Authority
RM	Revenue Management
RMS	Revenue Management Systems
SEM	Structural Equation Modelling
SNAP	Stay Night Automated Pricing

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References

- Abrate, G., & Viglia, G. (2016). Strategic and tactical price decisions in hotel revenue management. *Tourism Management*, 55, 123-132.
- Agarwal, S., Krishna Erramilli, M. and Dev, C.S. (2003), "Market orientation and performance in service firms: role of

- innovation", *Journal of Services Marketing*, Vol. 17 No. 1, pp. 68-82. <https://doi.org/10.1108/08876040310461282>
- Agiomirgianakis, G. M., Magoutas, A. I., & Sfakianakis, G. (2012). Determinants of profitability and the decision-making process of firms in the tourism sector: The case of Greece. *International Journal of Risk Assessment and Management*, 4(3/4), 294-299.
doi:10.1504/IJDSRM.2012.053381
- Akgün, A. E., Keskin, H., & Byrne, J. (2008). The moderating role of environmental dynamism between firm emotional capability and performance. *Journal of Organizational Change Management*.
- Anastassopoulos, G., Filippaios, F., & Phillips, P. (2009). An eclectic investigation of tourism multinationals: Evidence from Greece. *International Journal of Hospitality Management*, 28(2), 185-194.
- Anderson, C.K. and Xie, X., 2010. Improving hospitality industry sales: Twenty-five years of revenue management. *Cornell Hospitality Quarterly*, 51(1), pp.53-67.
- Awang, K. W., Ishak, N. K., Radzi, S. M., & Taha, A. Z. (2008). Environmental variables and performance: Evidence from the hotel industry in Malaysia. *International Journal of Economics and Management*, 2(1), 59-79.
- Azadegan, A., Patel, P. C., Zangouinezhad, A., & Linderman, K. (2013). The effect of environmental complexity and environmental dynamism on lean practices. *Journal of Operations Management*, 31(4), 193-212.
- Becerra, M., Santaló, J., & Silva, R. (2013). Being better vs. being different: Differentiation, competition, and pricing strategies in the Spanish hotel industry. *Tourism management*, 34, 71-79.
- Bertsimas, D. and Popescu, I., 2003. Revenue management in a dynamic network environment. *Transportation science*, 37(3), pp.257-277.
- Butler, B. S. (2001). Membership size, communication activity, and sustainability: A resource-based model of online social structures. *Information systems research*, 12(4), 346-362.
- Chiutsi, S., & Mudzengi, B. K. (2017). Tourism seasonality and destination management implications for Mana Pools tourist destination in Zimbabwe. *Afr J Hosp Tour Leis*, 6(2), 1-13.
- Chung, J. Y. (2009). Seasonality in tourism: A review. *E-review of Tourism Research*, 7(5).
- CIEC. (2020). *Kenya Hotel Room and Bed Occupancy Rate*. Retrieved July 3, 2021, from WWW.CEICDATA.COM/Kenya National Bureau of Statistics : <https://www.ceicdata.com/en/kenya/hotel-room-and-bed-occupancy-rate>.
- Cross, R.G., Higbie, J.A. and Cross, Z.N., (2011). Milestones in the application of analytical pricing and revenue management. *Journal of Revenue and Pricing Management*, 10(1), pp.8-18.
- Cytonn (2017). *Nairobi's Hospitality Sector Report*. *Cytonn Real Estate Nairobi*. <https://www.cytonn.com/uploads/downloads/hospitality-report-vf.pdf>
- Ferguson, M., & Smith, S. (2014). The changing landscape of hotel revenue management and the role of the hotel revenue manager. *Journal of Revenue and Pricing Management*, 13(3), 224-232.
- Ferreira, A., & Otley, D. (2010). Design and use of management control systems: an analysis of the interaction between design misfit and intensity of use. *CIPFA (Chartered Institute of Public Finance and Accountancy)*, London.
- Fiedler, F. (1958). Fiedler's contingency theory. *Leader Attitudes and Group Effectiveness*.
- González-Serrano, L., & Talón-Ballester, P. (2020). Revenue Management and E-

- Tourism: The Past, Present and Future. *Handbook of e-Tourism*, 1-28.
- Guadix, J., Cortés, P., Onieva, L., & Muñuzuri, J. (2010). Technology revenue management system for customer groups in hotels. *Journal of Business Research*, 63(5), 519-527.
- Hernandez, N. (2015). Restaurant Revenue Management: Examining Reservation Policy Implications at Fine Dining Restaurants.
- Hospitality-Professionals-Association, (2013). Revenue Management: An introduction to practitioners. Bournemouth BH2 5Q: Hospitality Professionals Association, Wentworth Jones Limited.
- Irandu, E. M. (2006). Sustainable tourism development on Kenya's coast: a hospitality sector view. *Anatolia*, 17(2), 189-209.
- Ivanov, S., & Zhechev, V. (2012). Hotel revenue management—a critical literature review. *Tourism: an international interdisciplinary journal*, 60(2), 175-197.
- Jeffrey, D. and Barden, R.R.D. (2000a), "An analysis of daily occupancy performance: a basis for effective hotel marketing? *International Journal of Contemporary Hospitality Management*, Vol. 12, pp. 179-89.
- Jeffrey, D. and Barden, R.R.D. (2000b), "Monitoring hotel performance using occupancy time-series analysis: the concept of occupancy performance space", *International Journal of Tourism Research*, Vol. 2, pp. 383-402.
- Jumia-Hospitality, (2019) Jumia hospitality Report 2019, 3rd edition. Retrieved on 3/7/2021 from <https://www.hospitalitynet.org/file/152008745.pdf>
- Kaminski, J., & Smith, B. S. (2016, July 18). *An HVS Guide to Hotel Revenue Management*. Retrieved July 30, 2020, from www.hvs.com: <https://www.hvs.com/article/7733/an-hvs-guide-to-hotel-revenue-management/#:~:text=For%20hotels%2C%20revenue%20management%20varies,business%20at%20a%20particular%20hotel>
- Karmarkar, S. and Dutta, G., (2011). Optimal table-mix and acceptance? rejection problems in restaurants. *International Journal of Revenue Management*, 5(1), pp.1-15.
- Kenya-National-Bureau-of-Statistics, (2020). Economic Survey 2020. Nairobi, Kenya. Retrieved on 12 July 2021 from <https://s3-eu-west-1.amazonaws.com/s3.amazonaws.com/119905/KNBS-Economic-Survey-2020.pdf>
- Kilali, B. (2016). *Factors Influencing Adoption of Information Communications Technology in Management of Hotels: a Case of Selected Five Star Hotels in Nairobi County, Kenya* (Doctoral dissertation, University of Nairobi).
- Kimes, S.E., 2003. Revenue management: A retrospective. *Cornell hotel and restaurant administration quarterly*, 44(5-6), pp.131-138.
- Koide, T., & Ishii, H. (2005). The hotel yield management with two types of room prices, overbooking and cancellations. *International journal of production economics*, 93, 417-428.
- Le Torc'h, M. (2013). *Revenue Management and it impacts on its actors in the hospitality industry* (Doctoral dissertation).
- Li, D. Y., & Liu, J. (2014). Dynamic capabilities, environmental dynamism, and competitive advantage: Evidence from China. *Journal of business research*, 67(1), 2793-2799.
- Mayer, J. (2014). Revenue management in hotel SMEs—a resort hotel case study. *Bachelor Thesis Tourism and hospitality Management*.
- Miricho, M. N. (2013). *Yield management strategy in Kenya's town hotels: opportunities and scope in room-stock management* (Doctoral dissertation, Doctoral dissertation, Kenyatta University).

- Mohd, W., Idris, S., & Momani, R. A. (2013). Impact of environmental dynamism on marketing strategy comprehensiveness and organizational performance. *International Journal of Business and Management*, 8(9), 40.
- Monnier, O., (2021) *A Ticket to Recovery: Reinventing Africa's Tourism Industry, 2021IFC*.
[https://www.ifc.org/wps/wcm/connect/news_ext_content/ifc_external_corporate_site/news+and+events/news/reinventing-africa-tourism#:~:text=start%20in%202022,\"- ,Unprecedented%20Crisis,Ivoire%27s%20and%20Kenya%27s%20combined%20GDP.](https://www.ifc.org/wps/wcm/connect/news_ext_content/ifc_external_corporate_site/news+and+events/news/reinventing-africa-tourism#:~:text=start%20in%202022,\)
- Morag, C. J. (2013). *Effective Revenue Management in the Hospitality Industry*, London, UK.: EyeforTravel Ltd. 2013.
- Murimi, M. & Wadongo, B. (2021). Application of Revenue Management Practices in Star-Rated Hotels in Kenya. *African Journal of Hospitality, Tourism and Leisure*, 10(2):559-574. DOI: <https://doi.org/10.46222/ajhtl.19770720-118>
- Njoroge, J. K., Ongeti, W. J., Kinuu, D., & Kasomi, F. M. (2016). Does external environment influence organizational performance? The case of Kenyan State Corporations. *Management and Organizational Studies*, 3(3), 41-51.
- Noh, S., Lee, H. C., & Lee, S. K. (2016). Exploring the determinants of strategic revenue management with idiosyncratic room rate variations.
- Noone, B. M., McGuire, K. A., & Rohlf, K. V. (2011). Social media meets hotel revenue management: Opportunities, issues and unanswered questions. *Journal of Revenue and Pricing Management*, 10(4), 293-305.
- Oaten, S., Le Quesne, K., Segal, H., & LLP, D. (2015). Adapting to Uncertainty—The Global Hotel Industry. *Travel Tour. Compet. Rep.*
- Odawa, E. L. (2017). *The efficacy of information and communication technology in creating competitive advantage in 3-5 star-rated hotels in Nairobi, Kenya* (Doctoral dissertation, Kenyatta University).
- Olsen, M. D., Tse, E. C., & West, J. J. (1992). Environmental scanning analysis form. *Strategic management in the hospitality industry*.
- O'Mahony, B., Galloway, G. A., Bergin-Seers, S., Lee, C., & McMurray, A. (2008). Seasonality in the tourism industry: Impacts and strategies.
- Ortega, B., 2016. Revenue management systems and hotel performance in the economic downturn. *International Journal of Contemporary Hospitality Management*.
- Pawlicz, A., & Napierala, T. (2017). The determinants of hotel room rates: an analysis of the hotel industry in Warsaw, Poland. *International Journal of Contemporary Hospitality Management*.
- Queenan, C. C., Ferguson, M. E., & Stratman, J. K. (2011). Revenue management performance drivers: An exploratory analysis within the hotel industry. *Journal of Revenue and Pricing Management*, 10(2), 172-188.
- Sainaghi, R. (2011). RevPAR determinants of individual hotels. *International Journal of Contemporary Hospitality Management*.
- Sampaio, C.A.F., Hernández-Mogollón, J.M. and Rodrigues, R.G. (2019), "Assessing the relationship between market orientation and business performance in the hotel industry – the mediating role of service quality", *Journal of Knowledge Management*, Vol. 23 No. 4, pp. 644-663. <https://doi.org/10.1108/JKM-08-2017-0363>.
- Santoro, G. (2015). Evaluating performance in the hotel industry: An empirical analysis of Piedmont.
- Shapiro, B.P. (1988), "What the hells is 'market oriented'?", *Harvard Business Review*, Vol. 66 No. 6, pp. 119-125

- Soohyang, N., Hee-Chan, L., & Seul, K. (2016). Exploring the Determinants of Strategic Revenue Management with Idiosyncratic Room Rate Variations, Sejong University, Republic of Korea. *agrillife.tamu.edu*, <https://agrillifecdn.tamu.edu/ertr/files/2016/12/RN99.pdf>.
- Speckbacher, G., & Offenberger, P. (2010). The design of management control systems in non-profit organizations: how can trust and control be balanced?. *Vienna University Of Economics And Business*.
- Tourism Regulatory Authority (2020). *Classification of Hotels in Kenya*. <https://www.tourismauthority.go.ke/index.php/quality-assuarance/classification-criteria>
- Tsang, E. W., & Yip, P. S. (2009). Competition, agglomeration, and performance of Beijing hotels. *The Service Industries Journal*, 29(2), 155-171.
DOI: 10.1080/02642060802294896
- Wadongo, B. I. (2014). Performance management and evaluation in non-profit organisations: an embedded mixed methods approach.
- Wadongo, B., & Abdel-Kader, M. (2014). Contingency theory, performance management, and organizational effectiveness in the third sector: A theoretical framework. *International Journal of Productivity and Performance Management*, 63(6), 680-703.
- Wang, C. L., Senaratne, C., & Rafiq, M. (2015). Success traps, dynamic capabilities and firm performance. *British Journal of Management*, 26(1), 26-44.
- Wijbenga, F. H., & Van Witteloostuijn, A. (2007). Entrepreneurial locus of control and competitive strategies—The moderating effect of environmental dynamism. *Journal of Economic Psychology*, 28(5), 566-589.
- Xiaowen, W., Xin, T., Kai, L., & Zhijian, H. (2013). Research on Factors Influencing Hotel Revenue Management Decision-making and Performance: An Empirical Study Based on High Star-rated Hotels in China. *Tourism Tribune/Lvyou Xuekan*, 28(9).

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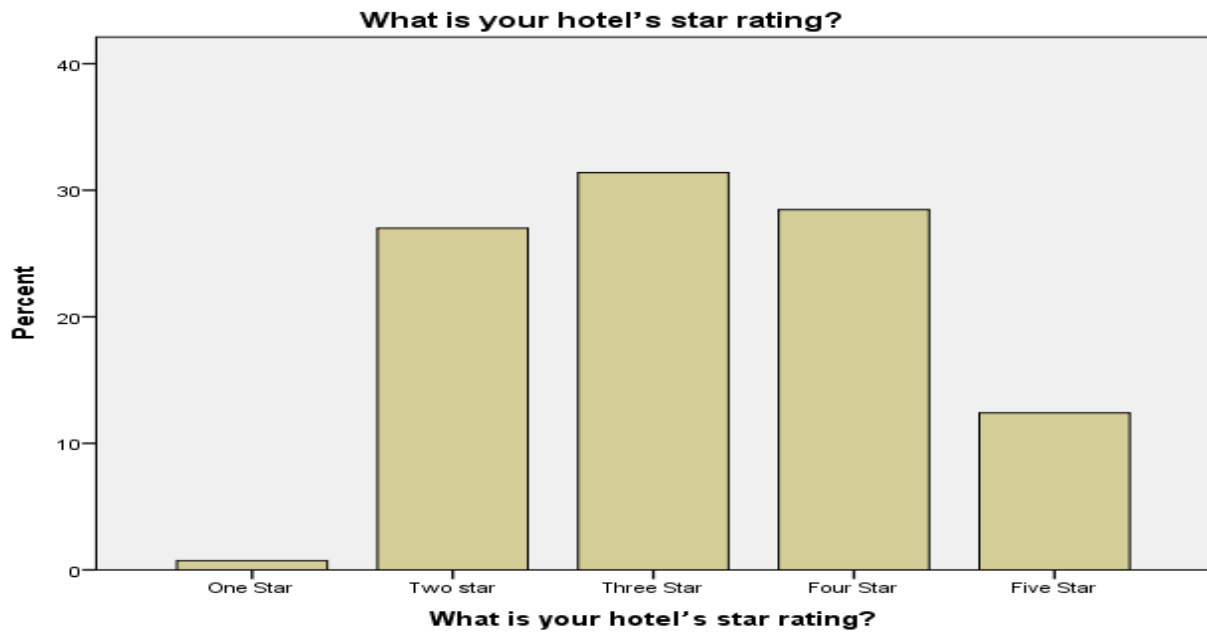


Figure 1. bar chart representing hotel star rating

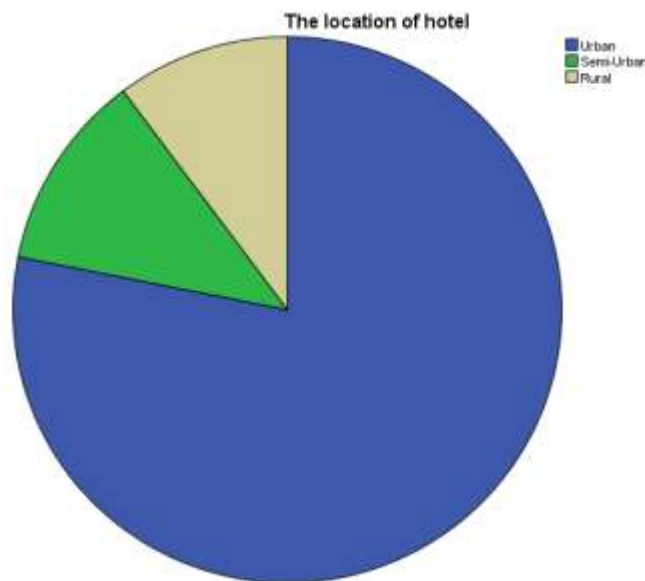


Figure 2. A pie chart showing the location of hotel

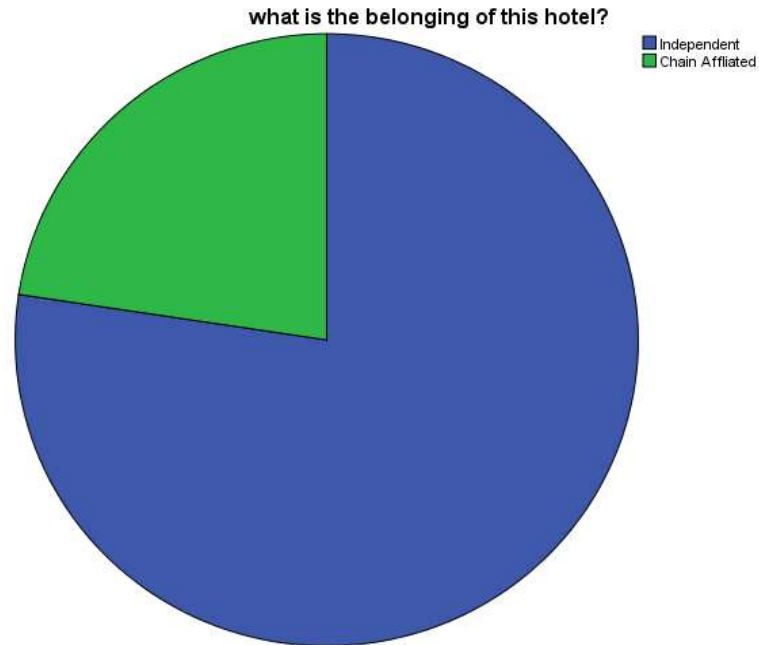


Figure 3. A pie chart showing the belonging of the hotel



Figure 4. A bar graph showing long the hotels have been in existence

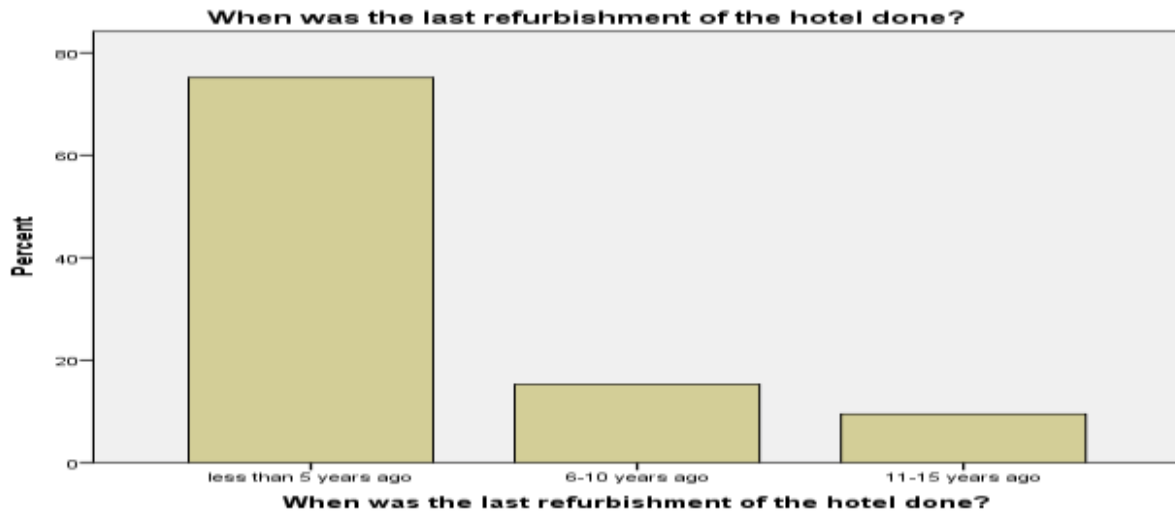


Figure 5. Last refurbishment of hotels

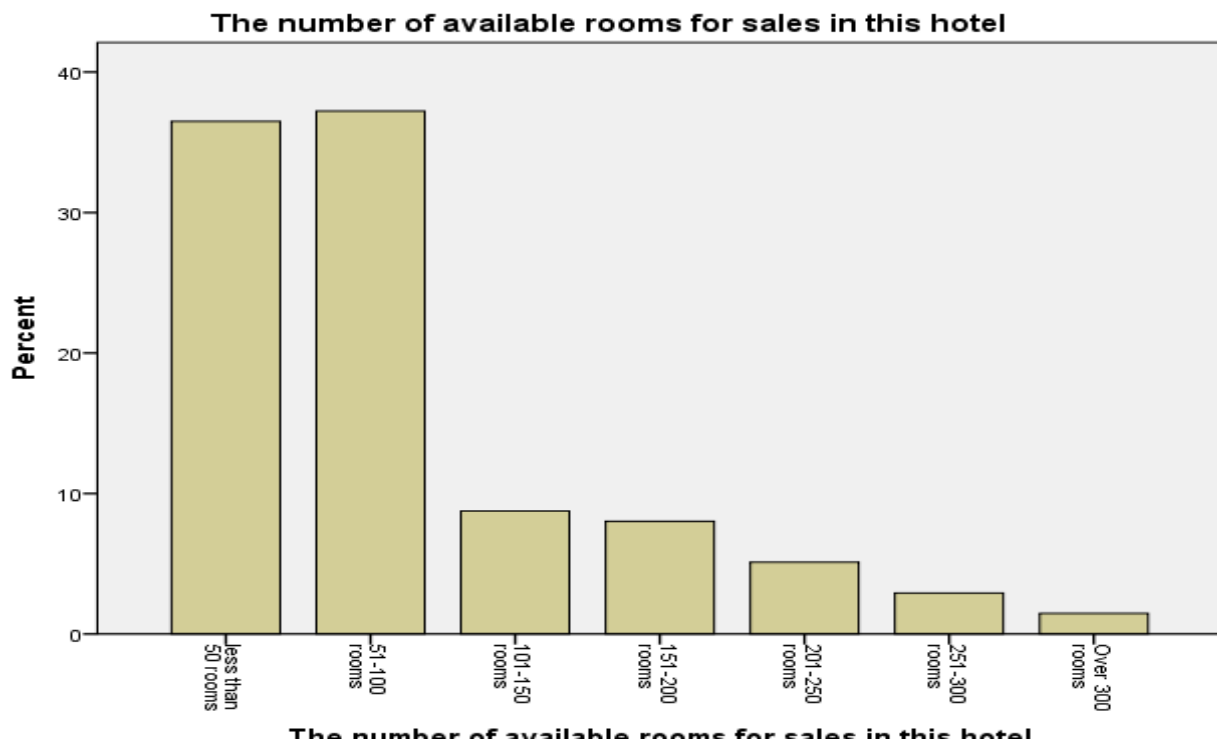
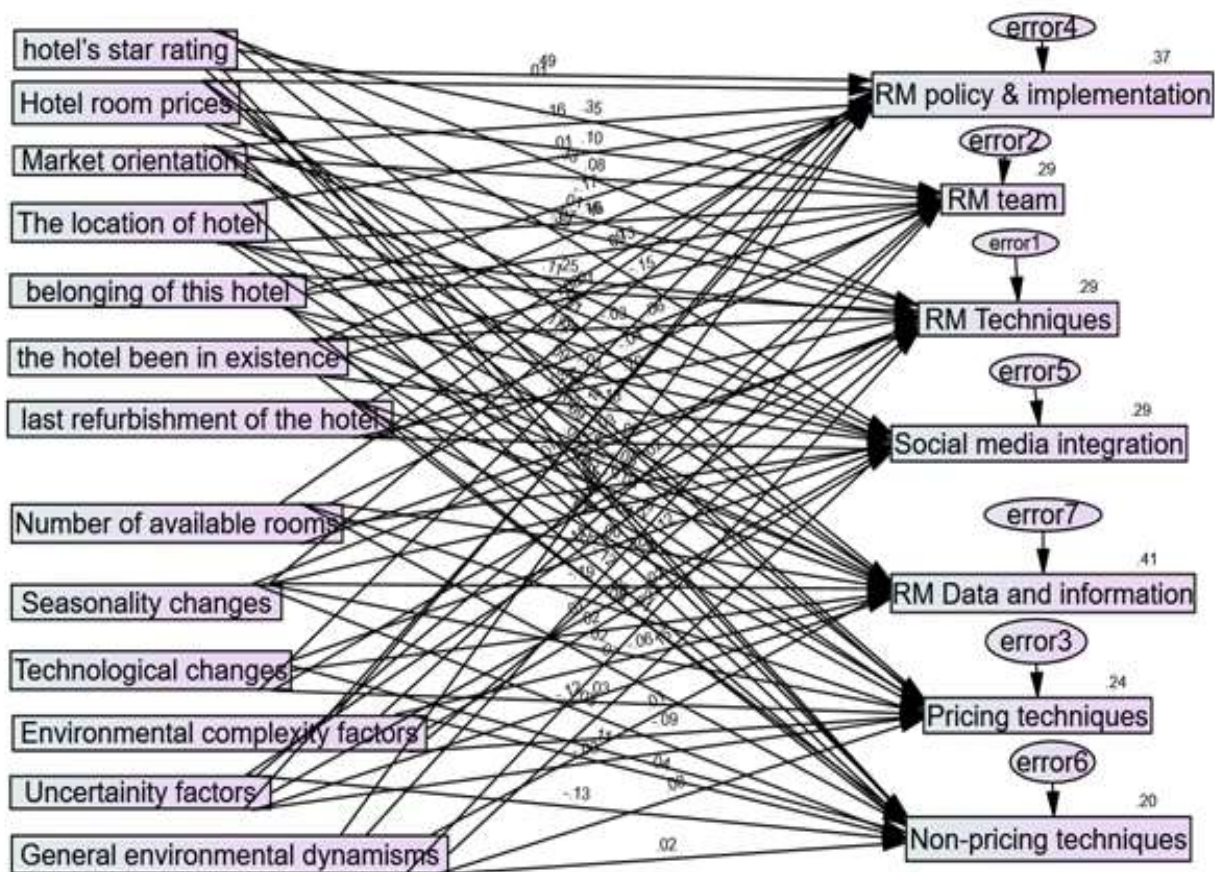


Figure 6. The number of available rooms in hotels

Standardized estimates |chi-square=114.59 (102df) p=0.054 CFI=.965 RMSEA=.0389 NFI=.959



SEM results on the relationship between determinants variable and revenue management practices

Figure 7. SEM results on the linkage between organizational determinants and revenue management practices

Table 1. Responses per region.

Region	Frequency	N Percent
NAIROBI METROPOLIS REGION	61	44.5
COAST REGION	16	11.7
WESTERN REGION	21	15.3
NORTH RIFT REGION	13	9.5
CENTRAL REGION	14	10.2
SOUTH RIFT REGION	8	5.8
EASTERN REGION	4	2.9
Total	137	100.0

Source: Authors computation, (2021)

Table 2. Room prices and market orientation affecting R.M. practices

Hotel Room prices	N	Frequency in Percentages					Mean	Std. Deviation
		Strongly Disagree	Disagree	Average	Agree	Strongly agree		
	Statistic						Statistic	Statistic
Room prices are fixed until the next reviews.	137	2.2%	8.8%	32.8%	37.2%	19.0%	3.62	.964
Hotel has low season and high season prices.	137	0%	7.3%	22.6%	38.7%	31.4%	3.94	.914
Hotel uses local and foreign visitor prices.	137	5.1%	19.7%	17.5%	23.4%	34.3%	3.62	1.278
Room prices vary according to the market being quoted.	137	0.7%	23.4%	43.8%	23.4%	8.8%	3.16	.909
Room prices are fixed with different discounts to different identified market segments.	137	1.5%	24.8%	38.0%	25.5%	10.2%	3.18	.972
When occupancy is low this hotel lowers the prices	137	0%	11.7%	26.3%	16.8%	45.3%	3.96	1.091
Hotel Market orientation								
Market orientation for this hotel is customer oriented	137	0%	5.8%	36.5%	38.0%	19.7%	3.72	.848
Hotel caters to the wants and needs of its clientele	137	0%	0%	18.2%	65.0%	6.8%	3.99	.594
Hotel practices the following; gathering and dissemination of information, and a quick responses to customer requests	137	0%	2.2%	29.9%	51.1%	16.8%	3.82	.727
Valid N (listwise)	137							

Source: Authors computation, (2021)

seasonality changes	N						Mean	Std. Deviation
	Statistic	Strongly Disagree	Disagree	Average	Agree	Strongly Agree	Statistic	Statistic
Hotel experiences low and peak customer seasons	137	0%	4.4%	28.5%	31.4%	35.8%	3.99	.907
Hotel is not affected by seasonal fluctuations of clients	137	0%	0.7%	23.4%	32.8%	43.1%	4.18	.815
Hotel can be able to predict seasonal fluctuations	137	0%	3.6%	25.5%	48.2%	22.6%	3.90	.789
Seasonal fluctuations of clients affects bookings/reservations of this hotel heavily	137	10.9%	19.7%	23.4%	17.5%	28.5%	3.33	1.362
Technological changes								
Hotel has adopted technological innovations in its operations	137	0%	0%	21.9%	46.0%	32.1%	4.31	2.656
Technological changes have improved operations in this hotel	137	0%	2.9%	21.2%	51.8%	24.1%	3.97	.757
Technological innovations adopted are vital in gathering information	137	1.5%	4.4%	24.1%	49.6%	20.4%	3.83	.854
The innovations are used in trailing prices	137	0%	5.1%	30.7%	41.6%	22.6%	3.82	.842
The innovations are used in forecasting	137	0.7%	8.0%	22.6%	46.0%	22.6%	3.82	.901
Technological changes have increased hotel efficiency	137	2.2%	7.3%	24.1%	33.6%	32.8%	3.88	1.025
Valid N (listwise)	137							

Source: Authors computation, (2021)

Table 4. Environmental complexity

Environmental complexity factors	N	Lowly	Moderately	Highly	Mean	Std. Deviation
	Statistic				Statistic	Statistic
Concentration of competitors within this location	137	3.6%	17.5%	78.8%	2.75	.511
Geographic concentration of target customers.	137	2.2%	48.2%	49.6%	2.47	.543
Labor availability	137	2.9%	55.5%	41.6%	2.39	.546
Variety of products/services provided by the hotel	137	3.6%	32.8%	63.5%	2.60	.562
Geographic location of the hotel	137	2.2%	16.1%	81.8%	2.80	.456
Uncertainty factors						
Changes in guest room rates	137	4.4%	43.1%	52.6%	2.48	.583
Changes in labor availability	137	24.1%	38.0%	38.0%	2.14	.778
Changes in demand for guest rooms	137	1.5%	9.5%	89.1%	2.88	.373
Changes in competitive tactics used by competitors	137	5.8%	32.8%	61.3%	2.55	.605
Changes in regulatory service and activities	137	5.8%	53.3%	40.9%	2.35	.589
Changes in customers' tastes and preferences	137	3.6%	46.0%	50.4%	2.47	.569
Oppression by fears and Pandemics	137	0%	20.4%	79.6%	2.80	.405
Changes in market structures	137	2.9%	10.9%	86.1%	2.83	.447
Valid N (listwise)	137					

Source: Authors computation, (2021)

Table 5 Revenue management practices in Kenyan hotels

	N	Never heard of R.M.	Have heard about R.M. but do not understand the meaning	Slightly	Fully	Mean	Std. Deviation
	Statistic					Statistic	Statistic
Formal Application of R.M. in hotels							
Revenue management is practiced in this hotel?	137	5.8%	32.8%	20.4%	40.9%	2.96	.988
Degree of respondent skills on R.M.		Basic Level	Intermediate Level	Expert	Advanced Level	Mean	Std. Deviation
Rate your degree of expertise on Revenue management	137	9.5%	38.0%	35.8%	16.8%	2.61	.894

Source: Authors computation, (2021)

	N						Mean	Std. Deviation
RM Policies & Implementation	Statistic	Strongly Disagree	Disagree	Average	Agree	Strongly Agree	Statistic	Statistic
Application of RM policies	137	07%	18.2%	32.1%	33.6%	15.3%	3.45	.985
Availability of RM implementer	137	2.9%	12.4%	34.3%	35.6%	15.3%	3.47	.993
RM team able to handle RM challenges	137	0%	8.8%	34.5%	35.3%	21.2%	3.69	.904
I.T. Integration in RM activities	137	2.9%	18.2%	41.6%	24.8%	12.4%	4.26	.993
Use of RM data & information	137	8.8%	13.1%	24.1%	33.6%	20.4%	4.42	1.241
Use of Pricing tools	137	6.6%	12.4%	43.1%	30.7%	7.3%	4.20	.976
Use of Non-pricing tools	137	3.6%	12.4%	27.7%	23.4%	32.8%	4.58	1.160
Valid N (listwise)	137							

Source: Authors computation, (2021)

Table 7. Regression Weights: (predictors of R.M. practices model)

	RM Techniques		RM Policy & implementation		Pricing techniques		R.M. team		R.M. Social media integration		RM data & information		Non-pricing techniques	
	Beta	P v	Beta	P	Beta	P	Beta	P	Beta	P	Beta	P	Beta	P
	R ² = 26.2%		R ² = 25.6%		R ² = 18.3%		R ² = 38.5%		R ² = 42.9%		R ² = 30.5%		R ² = 28.5%	
Predictors	Beta	P v	Beta	P	Beta	P	Beta	P	Beta	P	Beta	P	Beta	P
Star rating	.214	.024	.413	***	.377	.002	.235	.003	.217	.016	.606	***	.033	.771
Hotel room prices	.007	.959	.015	.925	-.242	.160	.111	.365	.120	.344	.254	.185	.433	.006
Market orientation	-.114	.342	-.301	.031	.169	.273	.106	.341	-.026	.819	.260	.130	.090	.528
Location of the hotel	.291	.002	-.006	.957	.076	.529	.170	.046	.250	.005	.001	.993	-.242	.029
Belonging of the hotel	.057	.662	-.312	.040	-	-	-.216	.073	-.046	.710	.140	.304	-.218	.158
Existence of the hotel	-.020	.662	.111	.043	.027	.648	-.081	.060	-.074	.093	-.022	.746	.039	.478
Last refurbishment	.114	.183	.135	.177	-.051	.644	.061	.429	-.062	.447	-.021	.868	-.011	.915
Available rooms for sale	.018	.681	-.049	.327	.053	.338	-.019	.629	-.006	.889	-.007	.907	.041	.423
Seasonality	.190	.139	-.141	.359	-.022	.898	-	-	.290	.020	-.397	.040	-.026	.869
Technological changes	-.095	.224	-.030	.752	.035	.747	-	-	.047	.534	.023	.846	.119	.225
Environmental complexity	.294	.129	.357	.114	-.289	.248	.052	.774	-.037	.841	-.172	.537	.113	.623
Un-certainty factors	-.394	.149	.247	.438	-.107	.761	.120	.632	.203	.431	-.460	.240	-.479	.140
General environmental dynamisms	.246	.007	.022	.838	.107	.365	.279	***	.161	.062	-.001	.994	.028	.796

Source: Authors computation, (2021)

Assessment of socio-demographic, knowledge, attitude, and workplace factors influencing exclusive breastfeeding practice by employees in Maseno University, Kenya

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Abstract

Formal employment is a barrier to Exclusive Breast Feeding (EBF) as recommended by World Health Organization (WHO). National breastfeeding policy recommends workplace breastfeeding support for working women. Currently, out of 2.56 million people in formal employment a third are women, but there is little scientific information to inform on challenges and successes they face during EBF. This study was assessing socio-demographic, knowledge, and workplace factors influencing exclusive breastfeeding practice. Through a cross-sectional study, 197 women were selected using purposive sampling. Logistic regression was used to determine relationships. Findings indicate that 42.6 % of women practiced EBF and 70.5 % had poor knowledge. Knowledge was the only factor significantly associated with EBF, OR=1.495 (0.763-2.931, P=0.014). The decision to EBF does not depend on socio-demographic characteristics and EBF attitude.

Keywords

Knowledge, attitude, workplace factors, exclusive breastfeeding, formal, employment

Background

World Health Organization (WHO) recommends infants should be exclusively breastfed for the first six months of life to achieve optimal growth, development and health (WHO 2011). It is recommended that breastfeeding should begin within one hour after birth. Early initiation of breastfeeding should be promoted and pre-lacteal feeds should be discouraged. Due to its high levels of vitamin A, antibodies, and other protective factors, the colostrum is often considered the baby's first immunization (WHO 2001). Exclusive breastfeeding protects against diarrhea and common childhood illnesses such as pneumonia, and may also have long-term health benefits for the mother and child, such as reducing the risk of overweight and obesity in childhood and adolescence (Brahmbhatt and Gray 2000). Breast milk contains all the nutrients an infant need in the first six months of life. By breastfeeding exclusively, the infant receives only breast milk. No other liquids or solids are given –

not even water – with the exception of oral rehydration solution, or drops/syrups of vitamins, minerals or medicines.

Lack of EBF is the most important risk factors for infant and young child morbidity and mortality including life-long impact like poor school performance, reduced productivity, and impaired intellectual development, (WHO 2001; WHO 2011). Worldwide, to reduce infant and young child mortality, EBF has been identified as one of the major cost-effective interventions (Brahmbhatt and Gray 2000). Despite the extensive information available on the benefits of EBF for women, infant and society, 39% of the children below six months are not exclusively breastfed in Kenya (Kimani, Ettarh et al. 2014; Matanda, Mittelmark et al. 2014). Employment has been cited as a barrier to exclusive breastfeeding practice (Brahmbhatt and Gray 2000; WHO 2001; Black, Allen et al. 2008) resulting in introduction of mixed

replacement feeding earlier than expected (Jones, Steketee et al. 2003).

Infants who are not exclusively breastfed and introduced to breast milk substitute or cow's milk earlier have been shown to increase the risk of Type 1 diabetes later in life (PMNCH 2015). As a result, more children before reaching the age of five still die from diseases whose underlying cause is malnutrition (Rice, Sacco et al. 2000). Exclusive breastfeeding has been identified as one of the Highest Impact Nutrition Intervention critical for child survival. Worldwide, a total of 6.3 million children under the age of five died in the year 2013 (UNICEF 2018). In Kenya, out of 1000 children born, 52 will die before reaching the age of five years (KNBS and International 2015). But, with exclusive breastfeeding more of these deaths could be prevented.

Sustainable Development Goal 2 (SDG 2) targets ending hunger especially amongst the vulnerable and the poor and ending all forms of malnutrition especially stunting and wasting of children under the age of five years (United Nations, 2015). Hence, a better understanding of the factors that influence EBF is necessary to promote appropriate infant feeding practices and attainment of SDG 2. In developing countries like Kenya, various maternal and child factors including maternal employment have been responsible for the low prevalence of EBF (Hanieh, Ha et al. 2015; Tadesse, Alemayehu et al. 2019). Due to increasing urbanization and level of education, the proportion of employed women in Kenya has been increasing gradually (KNBS and International 2015). Employed women in the formal and informal sectors face challenges combining work with maintaining breastfeeding. The return to work due to short maternity leave time may influence employed women not to start breastfeeding at all or discontinue EBF earlier than the recommended duration (Lowe, 2011).

In Kenya, women in formal employment are guaranteed three months maternity leave

(GOK 2017) but, this duration is not enough for many working women to sustain EBF for the required six months. Studies have shown that EBF's knowledge, women's attitude towards EBF and availability of EBF facilities at the work place influence employed women's EBF practices (UNICEF 2018). In this country, 61% of women practice EBF (KNBS and International 2015). However, not much is known about EBF practices by women in the formal employment as the only available study has generalized finding on employed women without drawing any distinction on how women in formal and informal employment exclusively breastfeed (Lakati, Binns et al. 2002). Given different work environments between the two, generalized information cannot adequately inform interventions. To enhance EBF and to ensure every child is exclusively breastfed, there is need for more insight on EBF by this "special" group of women (women in formal employment). This study therefore investigated knowledge, attitude and work place factors that influence EBF practice by women employees in Maseno University which is a public institution with total 794 women employees out of which 220 women having gone on leave in the last pre-ceding 5 years. The institution was purposively selected as study area because of curiosity to establish the status of EBF in this institution and also to provide the much lacking EBF information to inform interventions and other future studies in this area. In addition, findings will be crucial for the government and other organizations working to implement interventions that will promote EBF, and thereby decreasing the rates and burden of infant morbidity and mortality which may be as a result of such children not being exclusively breastfed.

Methodology

This study was a cross-sectional survey that was conducted in Maseno University among women in formal (full time) employment who had children aged five years and below. The research was approved by the department of Family, Nutrition and Consumer Sciences

and got ethical approval by Maseno University Ethics Review Committee (MUERC) reference number: MSU/DRPI/MUERC/00381/17.

Respondents consent was obtained verbally after given explanation about the purpose of the study.

Purposive sampling was done among the study population. A total of 794 women were fully employed in Maseno University, of which 220 were found to have taken maternity leave in the last five years. 20 participated in the pilot study and 197 were interviewed 3 were unreachable. Structured and validated questionnaire was used to collect data. The questionnaire was designed to elicit information on socio-demographic characteristics, knowledge, attitude and practice of exclusive breastfeeding as well as factors influencing its practice. Correctly defining exclusive breastfeeding, mentioning its duration and one of its advantage is regarded as good knowledge and failure in any is otherwise poor knowledge.

After administration of the questionnaires, each questionnaire was counter checked to ensure that they are correctly filled. Data was coded and analysis was done using frequency counts, percentages, correlation, logistic and binomial logistic regression yielding odd ratio. Descriptive summary statistics such as frequencies and percentages, charts and graphs was used to describe findings.

Inclusion/Exclusion criteria

The study included women who were not on leave and were willing to participate in the study and who were willing to provide a signed a consent form. Excluded included those whose consent was not obtained and those who were on leave despite having children below five years

Data collection

Data was collected by means of interviewer – administered questionnaires to women with children below the age of five years. Two students from the Department of Public Health with data collection experience were trained and assisted in data collection. The

questionnaire was divided into five sections focusing on socio-demographic characteristics, EBF practice, breastfeeding knowledge, breastfeeding attitudes and work place factors enabling or hindering EBF practice. To assess socio-demographic characteristics, four factors: age, marital status, educational level, and occupation were assessed. EBF knowledge was either good or poor with good knowledge considered by being able to define EBF, correctly mention its duration, and at least one of its benefits. Poor knowledge was failure to correctly respond to the above three factors. Work place factors enabling such as EBF breaks, expression room, crèches, flexible working time, supportive boss or hindering factors which was the unavailability of the enlisted. From an EBF study done on infants 0-6 months in Kenya (Mututho 2013), a questionnaire was adopted and modified.

Data analysis

The Iowa Infant Feeding Attitude Scale (IIFAS) was adopted to assess' breastfeeding attitude (Rice, Sacco et al. 2000). Test and re-test technique were used to ensure reliability and validity of research instruments. After administration of questionnaire, each questionnaire was counter-checked to ensure that they are correctly filled. Data was coded and analyzed using Statistical Package for Social Sciences (SPSS) version 20. A p -value of ≤ 0.05 was used as the criterion for assessing statistical significance. Logistic and binomial logistic regression yielding odd ratio was used to determine the relationship between dependent and independent variables. Descriptive summary statistics such as frequencies and percentages, charts and graphs was used to describe findings.

Results

A total of 197 questionnaires were filled representing 100 percent response rate. About 23.4% of the respondents were aged between 25-29 years old and those married were 86.3%. Undergraduate respondents were 33% with only a few having attained PhD degrees (5.1%). Prevalence of diploma, certificate and

those who were educated up to secondary level were 31.5%, 21.3% and 9.1%, respectively. Most of the respondents (31.5%) were from administrative staff followed by

support staff (18.3%), academic staff was 16.2%, and hotel/hostel staff 14.2%, health care workers 11.7% with minority being technicians 8.6% (Table 1).

Table 1. Socio - demographic information of the participants

Variables	Frequency (n)	Percentage (%)
Age (Years)		
20 -24	14	7
25-29	46	23.4
30-34	63	32
35-39	49	24.9
40-49	25	12.7
Marital status		
Single	27	13.7
Married	170	86.3
Educational level		
Secondary	18	9.1
Certificate	42	21.3
Diploma	62	31.5
Degree	65	33
Masters / PhD	10	5.1
Occupation (Departments)		
Support staff	36	18.3
Technicians	17	8.6
Administration	61	31
HCWs	23	11.7
Academics	32	16.2
Hostel/Hotel staff	28	14.2

*HCWs - Health Care workers

Exclusive Breastfeeding Feeding Practice

Forty two point six percent of the respondents first introduced any other food or liquid to their infants besides breastfeeding when their

children were six months while 9.6 % of the respondents introduced other feed or liquid to their infants by five months (Figure 1).

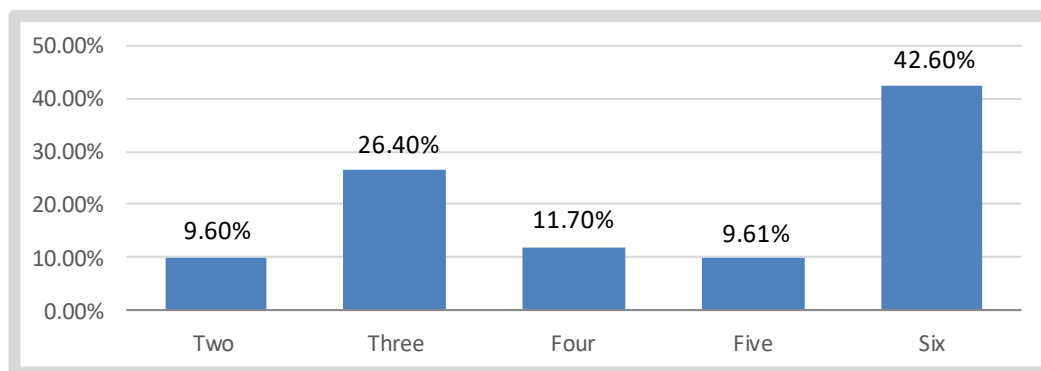


Figure 1. Time taken introduce other foods / liquid besides breastfeeding in minutes

Socio-demographic Factors and Exclusive Breastfeeding Practice

Women aged 25-29 years were more likely to engage in EBF unlike those aged 45 – 49 years old. Age, marital status and occupation were

not significantly associated with EBF. However, level of education having ($P=0.001$) was significantly associated to EBF practice (Table 2).

Table 2. Relationship between Socio-demographic Characteristic and Exclusive Breastfeeding Practice

Characteristics of the study women	Categories	Participants n(%)	Odds Ratio on EBF	P-value
Age	20-24 (Ref)	14 (7 %)		
	25-29	46 (23.4 %)	1.455 (0.345 - 4.86)	0.543
	30-34	63 (32 %)	0.877 (0.77 2 - 0.834)	0.827
	35-39	49 (24.9 %)	1.086 (0.328 - 3.603)	0.892
	40-49	25 (12.7 %)	0.518 (0.131- 2.045)	0.348
Marital status	Single (Ref)	27 (13.7 %)		
	Married	170 (86.3%)	1.576 (0.671-3.715)	0.295

Level of education		n(%)	Odds Ratio on EBF	P-value
Level of education	Secondary (Ref)	18 (9.1 %)		
	Certificate	42 (21.3 %)	0.154 (0.045 – 0.526)	0.003
	Diploma	62 (31.5 %)	0.260 (0.82 - 0.820)	0.022
	Degree	65 (33 %)	0.373 (0.119 - 1.166)	0.090
	Masters and PhD	10 (5.1 %)	0.96 (0.015 - 0.619)	0.014
Occupation		n (%)		
	Support staff (Ref)	36 (18.3 %)		
	Technicians	17 (8.6 %)	0.993 (0.313 - 3.155)	0.991
	Administrative staff	61 (31 %)	1.013 (0.444 - 2.311)	0.976
	HCWs	23 (11.7 %)	0.489 (0.162 - 1.474)	0.204
	Academic staff	32 (16.2 %)	0.373 (0.133 - 1.047)	0.061
	Hostel / hotel staff	28 (14.2 %)	1.269 (0.419 - 3.470)	0.615

Knowledge and Exclusive Breastfeeding Practice

This study revealed that 87% women have heard the term EBF but only 43.1% had good EBF knowledge. The association between EBF knowledge and practice of EBF was significant, $P=0.014$. Those who had good

breastfeeding knowledge were 1.495 more likely to carry out EBF than those who had poor knowledge, $OR=1.495$ (0.763 – 2.931), $p=0.014$ (Table 3).

Being that 43.1 % women had good EBF knowledge and those who were able to exclusively breastfed were 42.6%, it can be

concluded that EBF knowledge and EBF practice are correlated.

Table 3. Knowledge and Exclusive Breastfeeding, n=175

Knowledge on EBF	Frequency (n)	Percent
Knows	76	43.1
Don't know	99	56
Total	175	100

Workplace factors Promoting Breastfeeding Practice on Return to work

Though the majority (92%) of women continued to breastfeed after resuming to work from 3 months maternity leave, 8% completely stopped breastfeeding, meaning that such children were put on replacement feeding by the age of 3 months. For those who

continued to breastfeed, 50% stated that staying close to work place made it possible while 14% stated that it was the support of their boss and colleagues. Staying in servant's quarters enabled them to sneak back into their houses during tea and lunch breaks to breastfeed their infants (Table 4).

Table 4. Factors favorable for Continued Breastfeeding on Return to Work

Factors for continuity of breastfeeding	Frequency	Percent (%)
Expression of breast milk	27	14.8
Staying close	92	50.5
Flexible working time	32	17.6
Supportive boss/colleagues	31	17.1
Total	182	100.0

Factors for Non-continuity of Breastfeeding on Return to Work

For 80 % of the women who did not breastfeed their babies after resuming work, 53 % stated that lack of breastfeeding breaks

and rooms made it impossible for them to continue breastfeeding while 20 % stated work-load as the barrier for them to continue breastfeeding (Figure 2).

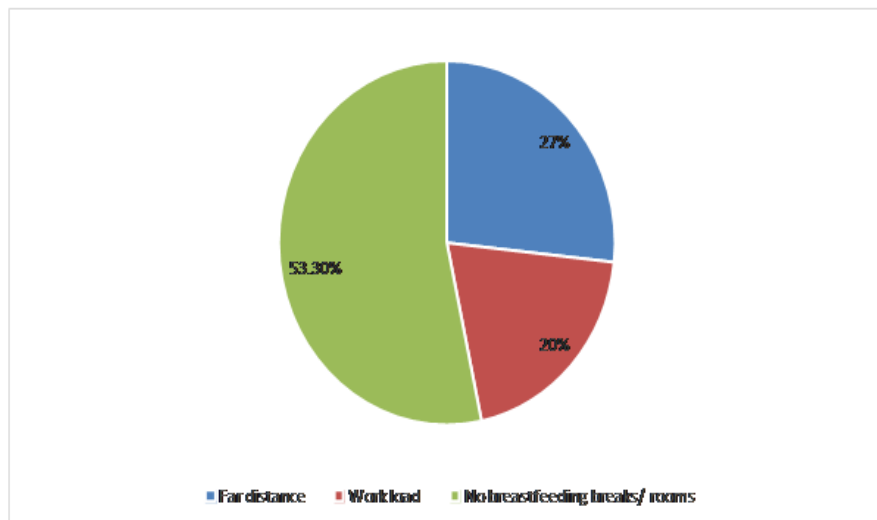


Figure 2. Factors for Non-continuity of Breastfeeding on Return to Work

Relationship between Breastfeeding Knowledge and Exclusive Breastfeeding Practice

There was significant association between exclusive breastfeeding knowledge and practice of exclusive breastfeeding, $p=0.014$. Those who had good knowledge of breastfeeding were 1.495 more likely to carry out exclusive breastfeeding than those who had poor knowledge, $OR=1.495$ ($0.763 -$

2.931), $p=0.014$.

Relationship of Breastfeeding Attitudes on Exclusive Breastfeeding Practice

Calculation on responses as per the findings on the frequency table resulted in mean IIFAS score, which was below 50. This shows that mothers have negative attitude towards exclusive breastfeeding (Table 6).

Table 5. Relationship of Breastfeeding Attitudes on Exclusive Breastfeeding Practice

Relationship between EBF and attitude	Score	Results
Positive attitude to EBF	52-85	-
Neutral	51	-
Negative attitude towards EBF	17 – 50	All

Factors favorable for Continued Breastfeeding on Return to Work

Fifty percent of the mothers who continued to breastfeed their babies on return to work stated that breaks/ staying close made it

possible for them to continue breastfeeding while fourteen percent stated that it was the support of their boss/ colleagues that made it possible for them to continue breastfeeding (Table 7).

Table 6. Factors enabling Continued Breastfeeding on Return to Work

Factors for continuity of breastfeeding	Frequency	Percent (%)
Expression of breast milk	27	14.8
Staying close	92	50.5
Flexible working time	32	17.6
Supportive boss / colleagues	31	17.1

Discussion

According to Kenya National Bureau of Statistics (KNBS) and Macro 2014 (Matanda, Mittelmarm et al. 2014), 62 % of women in Kenya EBF their infants and in Kisumu County, 84.4 % of women practice EBF (KNBS and International 2015). From the two reports EBF rates is seemingly high. However, its' not clear how many employed women were able to exclusively breastfeed to enable comparison with this study findings which found EBF among employed women to be low. Findings of this study is in agreement with those of a similar study done in Nairobi, which concretely reported EBF rate among working women to be low (Lakati, Binns et al. 2002).

In a study done in Nigeria (Ademola, Adenike et al. 2011), it was found that employed women aged above 25 year were more likely to EBF a finding which has been supported by the finding of this study. However, in a different study done in Ghana (Abigael, Envuladu et al. 2003) older women 30 years and above were found to be more likely to EBF. For employed women, there is no consistency as to how age influences EBF practice.

Findings of this study that women's level of education determines EBF decision supports finding of a study done in Morocco (Habibi, Laamiri et al. 2018), whereby EBF practice was significantly associated to mothers level of education. However, the difference in the two studies is the likeliness to EBF in regard to women's level of education. In this study it was found that the more a woman is educated the less likely she will practice EBF unlike in the Moroccan study where it was reported that the more the woman's level of education

increases the more likelihood that they will EBF.

Several reviews reported similar finding (Dyson, Renfrew et al. 2009). On the contrary, a study done in Ghana (Danso 2014) reported that having good EBF knowledge does not necessarily translate to an increase in EBF rate. Given that, findings of most studies have shown positive correlation between EBF knowledge and EBF practice, further interventions to improve EBF rate need to include capacity building for women.

In contrast to this study's finding that all working women prefer replacement feeding as opposed to breastfeeding on return to work, a study done in Saudi Arabia (Maryam 2016), showed that 17.9 % working mothers continued breastfeeding their infants for a period of between 4-6 months upon return to work. The reason could be that the Saudi Arabia women had good EBF knowledge than their Kenyan counter parts. Findings of this study that negative EBF attitude negatively affect EBF practice is consistent with findings of previous studies done in Saudi Arabia and Italy (Danso 2014; Vijayalakshmi, Susheela et al. 2015). In this study, certificate holders were more likely to EBF than those with masters and PhD degrees. Finding similar to results from Jordan (Shi, Zhang et al. 2008) where less educated women were more likely to EBF than women of higher educational level.

This study's finding that availability of breastfeeding friendly environment upon return to work encourages women to continue breastfeeding after returning to work from maternity leave is in agreement with that of a study done in Taiwan (Su-Ying 2013). In a

different study, encouragement, and support by fellow employees and employers enable breastfeeding continuity by employed women (Chekol, Biks et al. 2017). This support could be in the form of work cover up by co-workers and flexible work schedule by the employer. More efforts need to be put by breastfeeding champions to push government and other employers to provide work place breastfeeding friendly environment as stipulated in the Kenya breastfeeding policy.

Conclusions

This study has revealed that learned women have limited EBF knowledge and unfriendly breastfeeding work environment affects their EBF practices. As a result, many infants are not exclusively breastfed resulting to exposure to known dangers of not being exclusively breastfed. To ensure that all children benefits from EBF, EBF promotion strategies which include information, education and communication messages need to equally focus on this category of women as more efforts and emphasis has always been on women who are perceived to be disadvantaged.

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References

1. Abigael, A., E. Envuladu, et al. (2003). "Barriers and facilitators to the practice of exclusive breastfeeding among working class mothers: A study of female resident doctors in tertiary health institutions in Plateau State." *Journal of Medical Research* 2(1): 112-116.
2. Ademola, M. A., M. Adenike, et al. (2011). "As study of the knowledge and support level of breast-feeding among the workers in formal employment in South- West Nigeria." Scholar Research Library.
3. Black, R. E., L. H. Allen, et al. (2008). "Maternal and child undernutrition: global and regional exposures and health consequences." *Lancet* 371(9608): 243-60.
4. Brahmabhatt, H. and R. H. Gray (2000). "Breastfeeding and the prevention of infant mortality." *Lancet* 355(9212): 1370.
5. Chekol, D. A., G. A. Biks, et al. (2017). "Exclusive breastfeeding and mothers' employment status in Gondar town, Northwest Ethiopia: a comparative cross-sectional study." *Int Breastfeed J* 12: 27.
6. Danso, J. (2014). "Examining the Practice of Exclusive Breastfeeding among Professional Working Mothers in Kumasi metropolis of Ghana." *International Journal of Nursing* 1(1): 11-24.
7. Dyson, L., M. J. Renfrew, et al. (2009). "Policy and public health recommendations to promote the initiation and duration of breastfeeding in developed country settings." *Public Health Nutr* 13(1): 137-44.
8. GOK (2017). Kenya Health Act. Health. Nairobi, Government Press.
9. Habibi, M., F. Z. Laamiri, et al. (2018). "The impact of maternal socio-demographic characteristics on breastfeeding knowledge and practices: An experience from Casablanca, Morocco." *Int J Pediatr Adolesc Med* 5(2): 39-48.
10. Hanieh, S., T. T. Ha, et al. (2015). "Exclusive breast feeding in early infancy reduces the risk of inpatient admission for diarrhea and suspected pneumonia in rural Vietnam: a prospective cohort study." *BMC Public Health* 15: 1166.
11. Jones, G., R. W. Steketee, et al. (2003). "How many child deaths can we prevent this year?" *Lancet* 362(9377): 65-71.

12. Kimani, J. K., R. Ettarh, et al. (2014). "Determinants of health insurance ownership among women in Kenya: evidence from the 2008-09 Kenya demographic and health survey." *Int J Equity Health* **13**: 27.
13. KNBS and I. International (2015). 2014 KDHS Key Findings. Rockville Maryland.
14. Lakati, A., C. Binns, et al. (2002). "Breast-feeding and the working mother in Nairobi." *Public Health Nutr* **5**(6): 715-8.
15. Maryam , S. (2016). Breastfeeding Among Working Mothers in Saudi Arabia, University of South Carolina. **Masters**.
16. Matanda, D. J., M. B. Mittelmark, et al. (2014). "Reliability of demographic and socioeconomic variables in predicting early initiation of breastfeeding: a replication analysis using the Kenya Demographic and Health Survey data." *BMJ Open* **4**(6): e005194.
17. Mututho, L. N. (2013). Factors influencing exclusive breastfeeding among infants less than 6 months in Kasarani informal settlement, Molo-District, Kenya. Nairobi, Kenyatta University.
18. PMNCH (2015). The partnership for Maternal Newborn & Child Health 2015 Accountability Report. Strengthening Accountability: Achievements and Perspectives for Women's Children's and Adolescence Health. Geneva.
19. Rice, A. L., L. Sacco, et al. (2000). "Malnutrition as an underlying cause of childhood deaths associated with infectious diseases in developing countries." *Bull World Health Organ* **78**(10): 1207-21.
20. Shi, L., J. Zhang, et al. (2008). "Breastfeeding in rural China: association between knowledge, attitudes, and practices." *J Hum Lact* **24**(4): 377-85.
21. Su-Ying (2013). "Impact of a Breastfeeding Friendly Work place on an Employed Mother's Intention to continue Breastfeeding after returning to work." *Breastfeeding Med* **8**(2): 10-16.
22. Tadesse, F., Y. Alemayehu, et al. (2019). "Exclusive breastfeeding and maternal employment among mothers of infants from three to five months old in the Fafan zone, Somali regional state of Ethiopia: a comparative cross-sectional study." *BMC Public Health* **19**(1): 1015.
23. UNICEF (2018). Impact Report 2014-2018. Nairobi.
24. Vijayalakshmi, P., T. Susheela, et al. (2015). "Knowledge, attitudes, and breast feeding practices of postnatal mothers: A cross sectional survey." *Int J Health Sci (Qassim)* **9**(4): 364-74.
25. WHO (2001). Global strategy for infant and young child feeding. Fifty Fourth World Health Assembly, Geneva, WHO.
26. WHO. (2011, 15/january /2011). "Exclusive breastfeeding for six months best for babies everywhere." Retrieved 4/5/2019, 2019.

Bulk sediment geochemistry, a proxy palaeowater quality indicator of the Mid-Late Pleistocene beaches of Rusinga-Mfangano Islands, Lake Victoria, Kenya

By

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Abstract

A multi-proxy study for past water quality was carried out on bulk sediment geochemistry of 350 lacustrine samples from the 3-4 m, 12-14 m, 18-20 m beaches above the present-day lake level, within Rusinga-Mfangano Islands, Lake Victoria, Kenya. There was a progressive increase in lake elemental ion input values for sodium, potassium, calcium, magnesium, and strontium measured using Atomic Absorption Spectrometry, from the last radiocarbon dates ranging from 42,228 *cal.* yr BP to AD 1970 with an increase in sediment influx that peaked at AD 1447 and AD 1551, a period that encompasses the onset of the Little Ice Age. The mineralogy, organic and elemental geochemical proxies indicate a rejuvenating lake with higher nutrient and sediment supply sustained from the gulf during the last millennium. This study provides new insights into the utility of bulk sediment geochemistry for palaeowater quality proxies from former lakes shorelines and beaches, whose responses to extreme palaeoclimatic events have not been well understood over the last 50,000 years.

Keywords: Sediment geochemistry, palaeowater quality, Mid-Late Pleistocene beaches, Rusinga-Mfangano Islands, Lake Victoria

Introduction

Lake Victoria, the second-largest freshwater lake globally, has a surface area of 68,000 km² (Campbell et al., 2003; S. J. Kayombo, S.E, 2006; Piper et al., 1986). The Rusinga and Mfangano Islands, Lake Victoria basin, lies in the eastern part of Lake Victoria at the mouth of Winam Gulf with polygons perimeters of 41.1 and 39.0 km long with areas of 48.4 and 73.2 km², respectively (Figure 1). According to (Wayland, 1931) and (Brooks, 1950), the present Lake Victoria was more extensive in the past than at present, as the ancient shoreline extended as far as the rifts to the northwest and southeast and beaches as far as 300 feet (100 m) above the present lake level. Observed erosional surfaces (Campbell L.M et al., 2003; Campbell et al., 2003; S. Kayombo,

2006; S. J. Kayombo, S.E, 2006; Piper et al., 1986) in Rusinga-Mfangano Islands complexes at 320 feet (120 m), 120 feet (36 m) and 40 feet (12 m) depicting the lake beds of the Early, Middle and Late Pleistocene gradients, respectively (Kent, 1942). The shape and depth, which had a large surface area relative to its volume, and limited river in-flow make it vulnerable to climate changes (Johnson et al., 1996). Three fossil beaches, at 3, 12, and 18 m above current lake level, represent stages in the evolution of Lake Victoria as a Holocene lake (Kendall, 1969). During the Pleistocene-Holocene, (the last 30,000 yr B.P.), most of the global lakes levels fluctuations were witnessed (Grove et al., 1975; Hecky & Degens, 1973; Street & Grove, 1979; Talbot & Lærdal, 2000). Former

shorelines and beaches are suitable landscapes that aid in revealing past environmental changes. These, despite their importance as final sinks for most materials deposited near the lakes, seas, or any water bodies. No earlier lacustrine sediments had been recovered from cores beneath approximately 17 to 16 ka unconformities (Johnson et al., 1996).

Significant studies have been focused on east African lakes' and rivers' expansions and desiccations since the Last Glacial Maximum (Adamson et al., 1980; Butzer, 1980; Gasse et al., 1980; Gillespie et al., 1983; Street-Perrott & Harrison, 1985; Street-Perrott & N, 1983) with very few studies on the bulk elemental geochemistry for palaeowater quality for aquatic environments of the same age. Mechanistic analyses of the past state of water quality in the tropics have been hampered by the incomplete or poorly dated nature of paleoclimate data from critical regions and records (Odada et al., 2003; Odada et al., 2008). The representative of climate history on nearby continents is vital, yet paleolimnological studies yield a lot of information on Lake's hydro-climates from prehistoric times. (Kilham, 1979) studied the biogeochemistry of African lakes and rivers. Increased lead increased lead concentrations and other trace metals in Lake Victoria were found by (Onyari, 1985; Onyari & Wandiga, 1989). New data were published on the palaeosol to estimate the mean annual precipitation using the weathering index specifically for palaeo-vertisols (Beverly et al. (2017). The established Chemical Index of Alteration Minus Potassium (Beverly et al., 2017) within the outer periphery of Lake Victoria shoreline and not within the Rusinga-Mfangano Island beaches. The palaeosol features and bulk geochemistry in the Late Pleistocene (~94-36 ka) indicated palaeozones. These were seasonally dry but fertile soils with high salinity and sodicity (a measure of exchangeable sodium ions with other cations in soils) that limited existing aquatic and terrestrial vegetation to those whose tolerance is higher (Beverly et al., 2015; 2017).

Thus, this study was initiated to investigate the distribution patterns of the trace metals of sodium, potassium, calcium, magnesium and strontium in former lake shorelines and beaches of Rusinga-Mfangano Islands, Lake Victoria basin.

Methods

Study site

The present-day Lake Victoria basin in Eastern Africa shared by the three countries, i.e., Kenya, Tanzania and Uganda and lies at longitudes 31°37'E - 34°53'E and latitudes 00°30'N - 3°12'S with numerous islands (Piper et al., 1986; Welcomme, 1972) and a drainage basin of 258,000 km² (Figure 1). The Rusinga-Mfangano Islands lie on the eastern part of Lake Victoria Basin at the mouth of Winam Gulf. Rusinga Island is at 34°7'E - 34°14'E and 0°20' S - 0°26'S and Mfangano Island at 33°57'E - 34°4'E and 0° 25'S - 0°30'S (Figure 1). The present-day lake level's 3-4 m beaches were twenty-one, twelve from Rusinga Island and eight from Mfangano Island. The 12-14 m beaches above the present-day lake level were ten, six from Rusinga Island and four from Mfangano Islands. The 18-14 m beaches above the present-day lake level were only four, two from Rusinga and two from Mfangano Island (Figure 1). Fieldwork for the study was conducted from September 2017 to October 2018 within the Rusinga and Mfangano Islands. This covered the 3-4 m, 12-14 m, 18-20 m beaches above the present-day lake levels and the Present-day beaches (Figure 1).

Radiocarbon dating (AMS)

An age model developed based on the Atomic Mass Spectrometry (AMS) radiocarbon dates on bulk molluscan and sediment samples. The Laboratory analysis for the sediment samples was conducted after thorough sample pre-treatment and run for beaming at the *iThemba* radiocarbon dating and isotopic facility at the University of Witwatersrand.

Sediment geochemistry

The excavated sediment samples were analyzed for elemental ions of potassium, calcium, magnesium, strontium and sodium

using Atomic Absorption Spectrometry (AAS). The Fluorimeter at Maseno University and the given results depict different values for each element as measured. 1gm of each processed sample was weighed as wet water-sediment samples and later dried at the furnace at 105°C and processed for various elemental values. We analyzed the beach levels, i.e., 3-4 m, 12-14 m, and 18-20 m in Rusinga and Mfangano Islands. There was a total of thirty-four beaches analyzed at these levels, twenty-one for 3-4 m level, nine for 12-14 m level and four for the 18-20 m beach level from both Islands.

Statistical analyses

An age model was developed based on AMS radiocarbon dates on bulk sediments. Between 5-8 mg of bulk sediments with ostracodes were picked and analyzed at *iThemba* Laboratory. Samples were pre-treated with an acid etch and converted to calendar years (Cal AD) using INTCAL09 for ages older than 1950 AD and Bomb 13 NH3 (the 2013 bomb curve for the low latitudes in the Northern Hemisphere) for the dates that contained more than the baseline of per cent modern carbon. The age model used for analysis used for Rusinga-Mfangano beaches was CALIB version 5.10 (Stuiver et al., 2005). The calibration was done using the online CALIB Radiocarbon Calibration version 8.2 (Stuiver et al., 2005) at the website <http://calib.org/calib/calib.html>. The dates were converted to years AD using the online calibration of Post-Bomb ¹⁴C at the website <http://calib.org/CALIBomb/> (Reimer et al., 2004).

Results

The RusingaMfangano island beaches age model

The 3-4 m beaches above the present-day lake level on Ugina, Kiwari, Nyagina, Ulugi, Konyahero, Chiro, Kogallo, Kakrigu and Rusinga Island Lounge beaches had exposure to recent carbon in the samples (Figure 2), hence not used for the age model. Re-

sampling of these sites was done using their counterpart sediment cored samples to establish the relative ages of these affected beaches. The chronological ages modelled by Oxcal Program (Ramsey, 2009; Ramsey, 2017) from the 12-14 m beaches above the present-day lake level in sites of Wakula, Ulugi, Kisasi, Sena, Limande, Uutaa, Ugina, Sienga, Konyahero, Nyagina and Kogallo (Figure 2). The 18-20 m beaches above the present-day lake level in Makira and Nyakweri beaches were the oldest beaches established during the study (Figure 2). The R-mode studio's rcarbon model run applied negatively to the same data exemplifying more clarity. Using the linear model, we established that upward, or increasing ages were from Rusinga to Mfangano Island, having the oldest beaches in the chronology. We thereby found respective data (Figure 2) from the per cent recent carbon (pMC) for various sites (Reimer et al., 2004).

Bulk sediment geochemistry

Sodium (Na⁺) ion concentrations

Sodium concentration values from the 3-4 m beaches above the present-day lake level in Rusinga-Mfangano Islands ranged from 5.9 to 0.1 ppm, with an average of 1.024 ppm (Figure 3). The concentration for the 12-14 m beaches above the present-day lake level was 6.3 ppm, lowest was 0.1 ppm with an average of 0.86 ppm (Figure 3). The 18-24 m beaches above the present-day lake levels values ranged from 4.3 to 0.1 ppm with an average of 1.37 ppm, a lower value than the 3-4 m and 12-14 m above the present-day lake levels in Rusinga-Mfangano Islands (Figure 3). Hill et al., 1967 established that an increase in sodium above the ambient or natural levels may indicate pollution from a point or non-point sources or saltwater intrusion, as was observed from the measured concentrations from the beaches analyzed with a peak at 12-14 m beaches above the present-day lake level. The significant sources of sodium in detrital sedimentary rock types, typically feldspar, clay minerals, and shale have wide range of sodium concentrations between 0.1–9.2 % with a mean of 0.8 %, while sandstone averages 1.4 % (Hill et al., 1967), a value

lower than the measured beaches for this study. Total sodium values in floodplain sediment range from <0.15 to 2.74 %, with a median of 0.59 % (Hill et al., 1967). Van Plantinga, 2011, analyzed sodium oxide (Na_2O) on the Pleistocene archaeological sites in Rusinga Island, Wasiyira Beds, which, when converted to the sodium ions, ranged from 5.45 to 6.34 % with an average of 4.9 % weight.

Potassium (K^+) ion concentrations

Potassium concentration values for the lower level beaches of 3-4 m above the present-day lake level ranged from 72.4-0.1 ppm with an average of 8.03 ppm (Figure 4). The 12-14 m beaches values ranged from 47.1-0.1 ppm with an average of 7.96 ppm, and the concentration was lowest at the 18-20 m beaches above the present-day lake levels, ranging from 45.4-0.1 ppm with an average of 6.72 ppm (Figure 4). The World Health Organization & International Programme on Safety, 1996 (Organization & Safety, 1996) indicated that oceanic basalts contain substantial potassium ions concentrations (up to 400 ppm) settling in sediments, while rivers control about 2-3 ppm, a value lower than the observed for this analysis. The findings also indicated that granite is rich in potassium ions and may contain up to 2.5 % potassium, yet this was not observed on the analyzed sediments. Potassium present as K^+ (aq) ions and seawater contains approximately 4.5×10^{-5} g/L (WHO & Safety, 1996; Figure 4), a value when converted would predict most of the sediments under investigation were derived from stream and rivers.

Calcium (Ca^{2+}) ion concentrations

Calcium concentration values for the 3-4 m level beaches ranged from 82.4-0.1 ppm with an average of 9.36 ppm (Figure 5). The 12-14 m level beaches had slightly lower values than 61.1- 0.1 ppm with an average of 12.47 ppm, while the 18-20 m beaches above the present-day lake levels ranged between 57.2 and 0.2 ppm with an average of 15.34 ppm (Figure 5). Calcium values for Lake Victoria waters was 11.8 mg/L or 236 ppm (Talling & Talling,

1965). More calcium concentrations have been found on effluents than the lake sediments as 0.91 meq/L or 18.2 ppm compared to 0.48 meq/l or 9.6 ppm (Augustine, 2009), an average almost equivalent for the 18-20 m and 3-4 m beaches above the present-day lake level (Figure 5). Globally, the average calcium concentrations are 4.0 mg/L 80 ppm, and 20.7% of water samples have averages of ≤ 1.5 mg/L or 30 ppm (WHO & Safety, 1996). Calcium values in stream water range over three orders of magnitude, from 0.02 to 592 mg/L with an average of 40 mg/L (WHO & Safety, 1996).

Magnesium (Mg^{2+}) ion concentrations

Magnesium ion concentrations for the 3-4 m beaches above the present-day lake level ranged from 3.035 -0.18 ppm with an average of 1.62 ppm and had an anomaly at values from 0.62-1.06 ppm in Rusinga and Mfangano Islands. The 12-14 m level beaches magnesium values arose from 1.50-1.94 ppm, but it was from 1.37-1.96 ppm for the 18-20 m beaches above the present-day lake levels (Figure 6). Magnesium concentration anomaly observed on the last lake level analyzed seems to reoccur at approximately 1.3, 1.7 to 2.3 ppm values, a value equivalent to the trend in most of the mineral composing Archaean-Precambrian rocks in the area (WHO & Safety, 1996); Figure 6). In seawater, magnesium ions present is about 1300 ppm, the highest quality after sodium. In freshwater, the concentrations range from <10 to 50 mg/L (Hem 1985). In rivers, approximately four ppm contains magnesium, while on average, algae and oysters have about 6,000 to 1200 ppm ((WHO) & Safety, 1996).

Strontium (Sr) ion concentrations

The observed strontium values were extraordinarily higher than other sedimentary deposit values, ranging from 16-1600 ppm (WHO & Safety, 1996), compared to the 3-4 m beaches with a maximum of 1837.79 ppm and a minimum concentration value of 5.93 ppm and average of 289.54 ppm (Figure 7). The strontium ion values for the majority of

the 12-14 m level beaches was lower than 360 ppm as exhibited by the 3-4 m level apart from the anomaly observed after 1200 and 1400 ppm values for the later beaches being highest value 1395.02 ppm with an average of 241.14 ppm (Figure 7). Determined the ratios of Sr/Ca, Rb/Sr and Ba/Sr to be used for petrogenesis, the first two decreasing and the last increasing with magmatic evolution. Distribution of Sr is affected by strong adsorption on clay minerals with substitution of Ca^{2+} in carbonates and Ba^{2+} for sulfates (Simmons, 1999). Sr enrichment in limestone and evaporites is common for up to concentrations of 1000 mg / Kg (Kulp et al., 1952).

Discussions

The knowledge of the modal assemblage of rock is equivalent to its primary bulk elemental composition (Okungu et al., 2005). The key components that build the principal rock-forming minerals are the major elemental compositions. The sodium cycle, is one of the essential geochemical cycles is a significant constituent of crustal rocks, sediments, and ocean water. The concentration and behaviour of trace metals in any lake are controlled by factors related to the chemistry of brines (evaporite deposits) and the region's geological setting (Kabata-Pendias & Pendias, 2000; Kasedde et al., 2014).

The Lake Victoria basin comprises the Neoproterozoic greenstone belt, in western Kenya, which is part of the Tanzania Craton of East Africa (Opiyo-Akech et al., 1999), have higher elemental concentrations compared to the measured lake sediments. The heavy rare-earth element (HREE) typical of a greenstone trondhjemite-tonalite-granodiorite (TTG) plutonic suite from the Archaean, have high barium and strontium contents and low adakitic (Y) signature (Opiyo-Akech et al., 1999). This belt is more potash-rich than most such suites in the sequence (Mboya, 1983). The rocks in the Mfangano and Rusinga Islands comprise nephelinitic (pyroxene-nepheline rocks), alnoitic (melilite-mica rocks) and carbonatitic

(calcite-magnetite rocks) within the strata of the Island complexes (Van Couvering, 1972), as sources of calcic and magnesium concentrations to the lake sediments. Rusinga and Mfangano Islands are volcanogenic with terrigenous admixture and layers. Epiclastic and pyroclastic detritus interlayer with autoclastic lava flow formation (Peppe et al., 2009; Van Couvering, 1972). Plotted tuff samples were found to be as trachytic on a total alkali-silica diagram (Van Plantinga, 2011) with variation as nearly phonolytic (Tryon et al., 2012) as the 12-14 m and 18-20 m beaches. In others, the models were nearly rhyolitic, while others were still trachytic-phonolytic (Van Plantinga, 2011) as the 18-20 m beaches. The tuff samples may have originated from a single eruption as the island-arc volcanic theory, (Van Plantinga, 2011) giving rise to the Mid Pleistocene lake sediments ranging from basaltic andesites to dacites, displaying similar geochemistry to the plutons. Sodium is dissolved from crustal rocks such as granite by rainwater. It moves from each of these reservoirs to the other over long geological times Streams and rivers carry it in solution to the sea, and it's vital for the reconstruction of the Mid-Pleistocene and Holocene palaeoclimatic history of the Rusinga-Mfangano Islands.

Conclusions

The data obtained from this study helps to reveal the temporal variations in geochemical characteristics of palaeowater qualities in the Lake Victoria basin, Rusinga-Mfangano Islands, with peaks at the Mid-Pleistocene increased to the Holocene. In all the beaches levels observed above the present lake level, a progressive increase in elements ions from the lower beaches to the higher ones suggesting frequent systematic inputs of sediments. The elements content exhibit multiple and rhythmic variations over glacial/interglacial periods.

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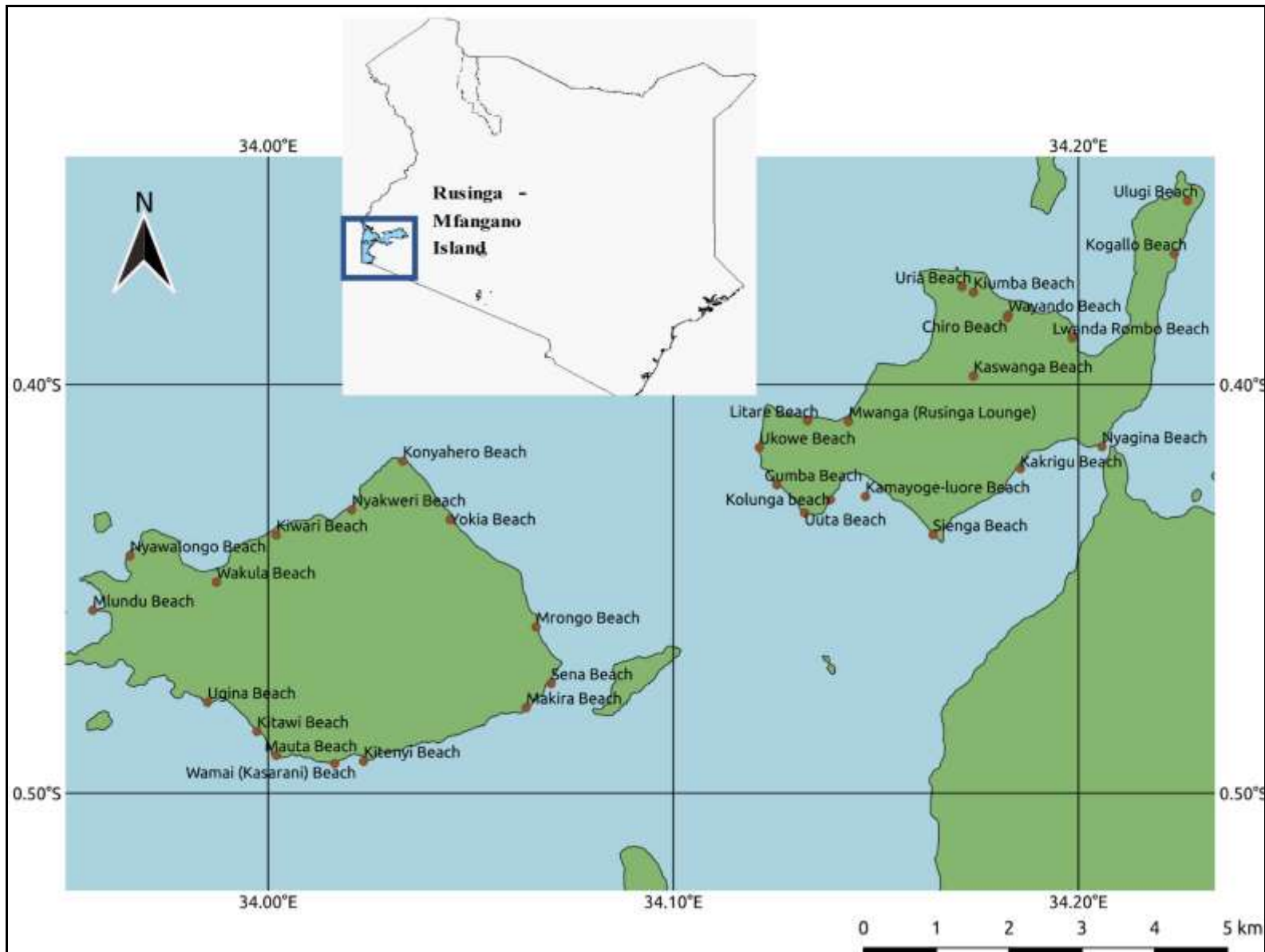


Figure 1. Map of Rusinga-Mfangano Islands with studied beaches (Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS,

USDA)

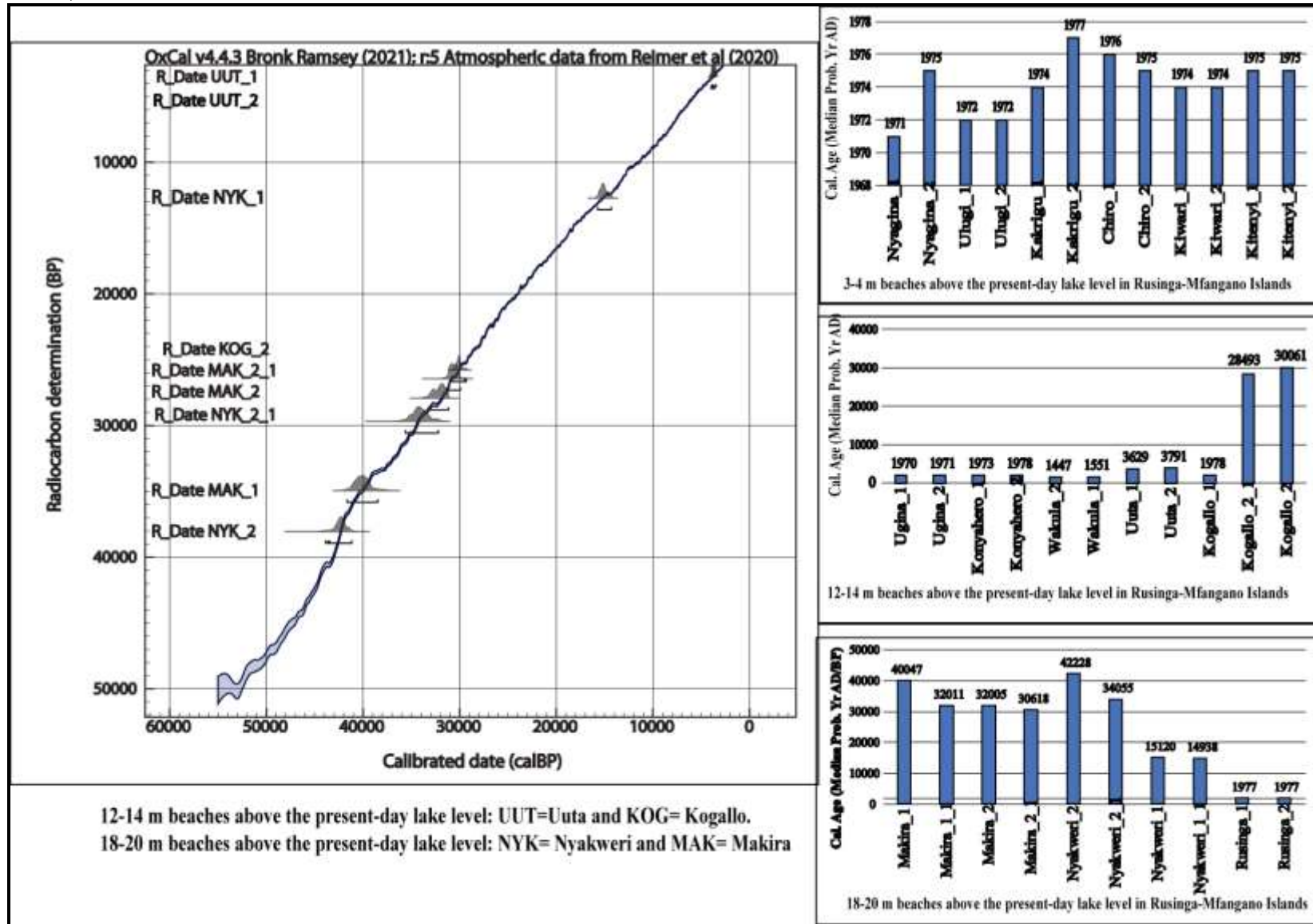


Figure 2. Age model calibration with Oxcal Program for Rusinga-Mfangano Island beaches

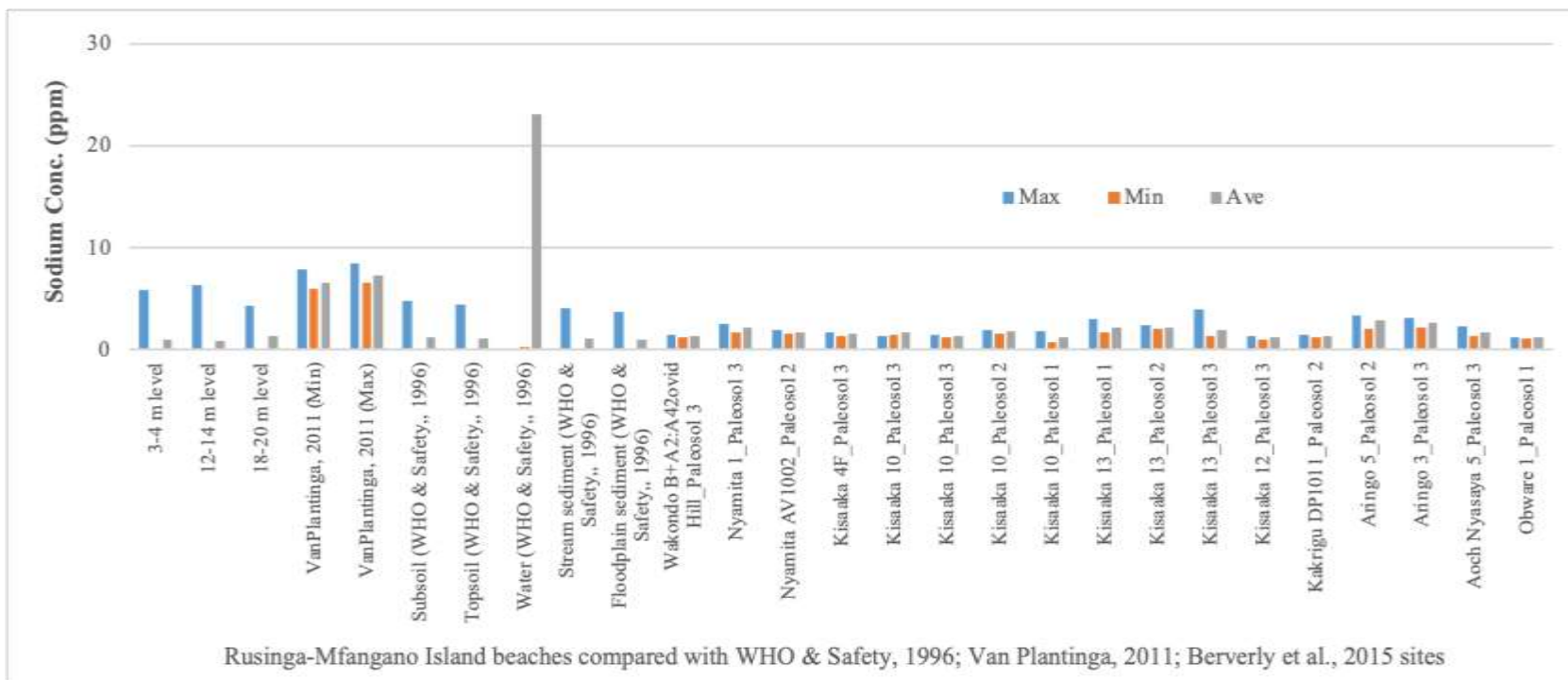


Figure 3. Bulk sediment geochemistry evaluation for sodium concentrations (ppm) for beaches levels 3-4 m, 12-14 m & 18-20 m of Rusinga-Mfangano Islands, compared with WHO & Safety, 1996, Berverly et al., 2015 and Van Plantinga, 2011 sites

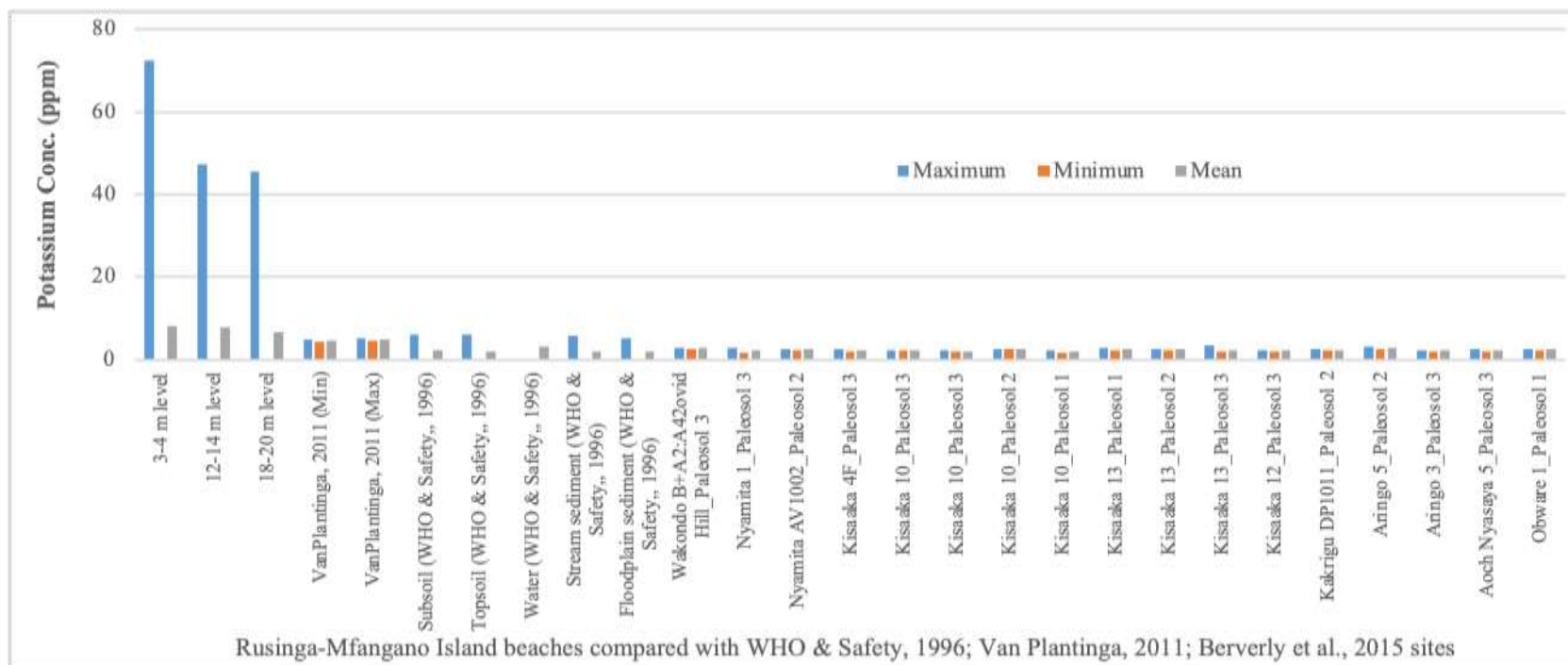


Figure 4. Bulk sediment geochemistry evaluation for Potassium concentrations (ppm) for beaches levels 3-4 m, 12-14 m & 18-20 m of Rusinga-Mfangano Islands, compared with WHO & Safety, 1996, Berverly et al., 2015 and Van Plantinga, 2011 sites

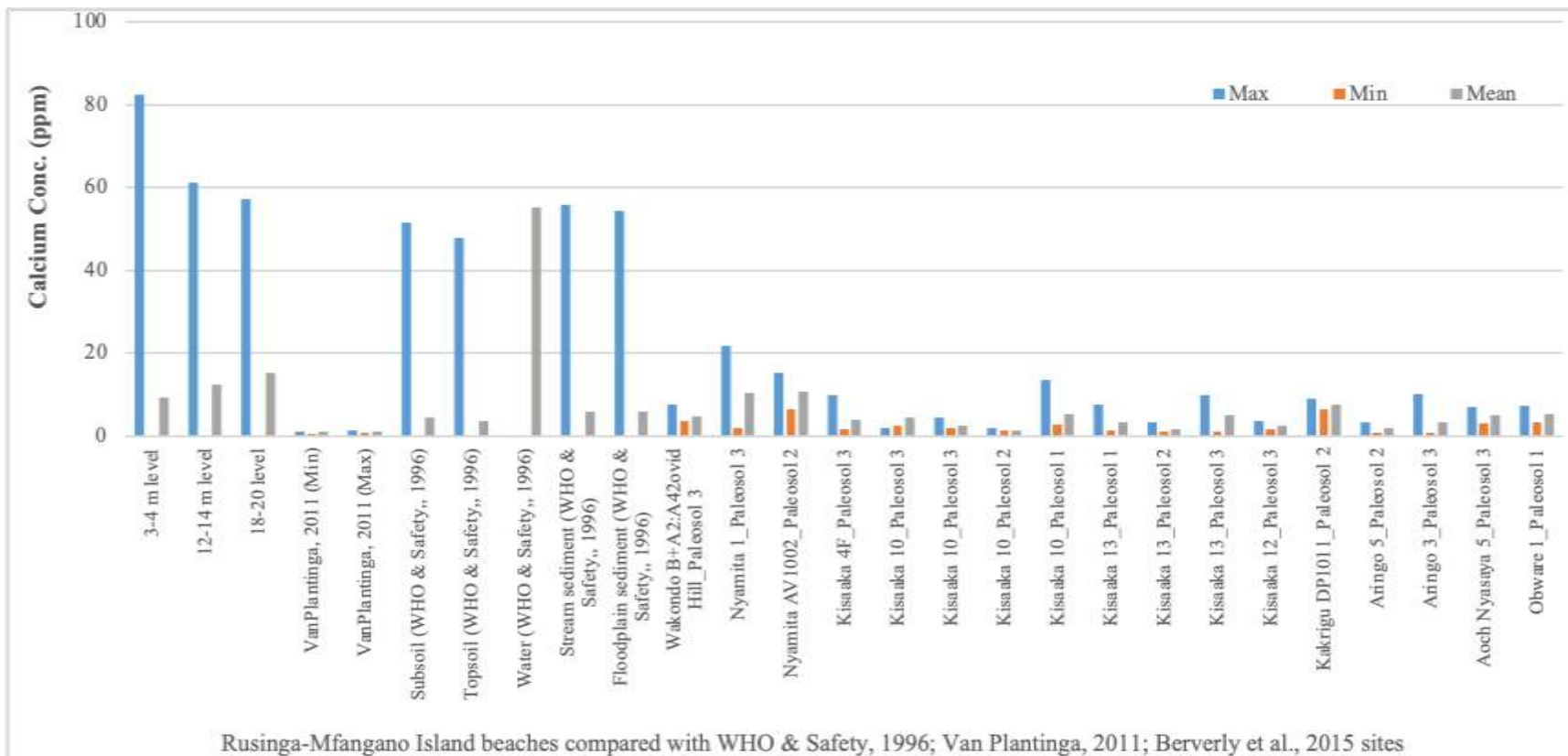


Figure 5. Bulk sediment geochemistry evaluation for calcium concentrations (ppm) for beaches levels 3-4 m, 12-14 m & 18-20 m of Rusinga-Mfangano Islands, compared with WHO & Safety, 1996, Berverly et al., 2015 and Van Plantinga, 2011 sites

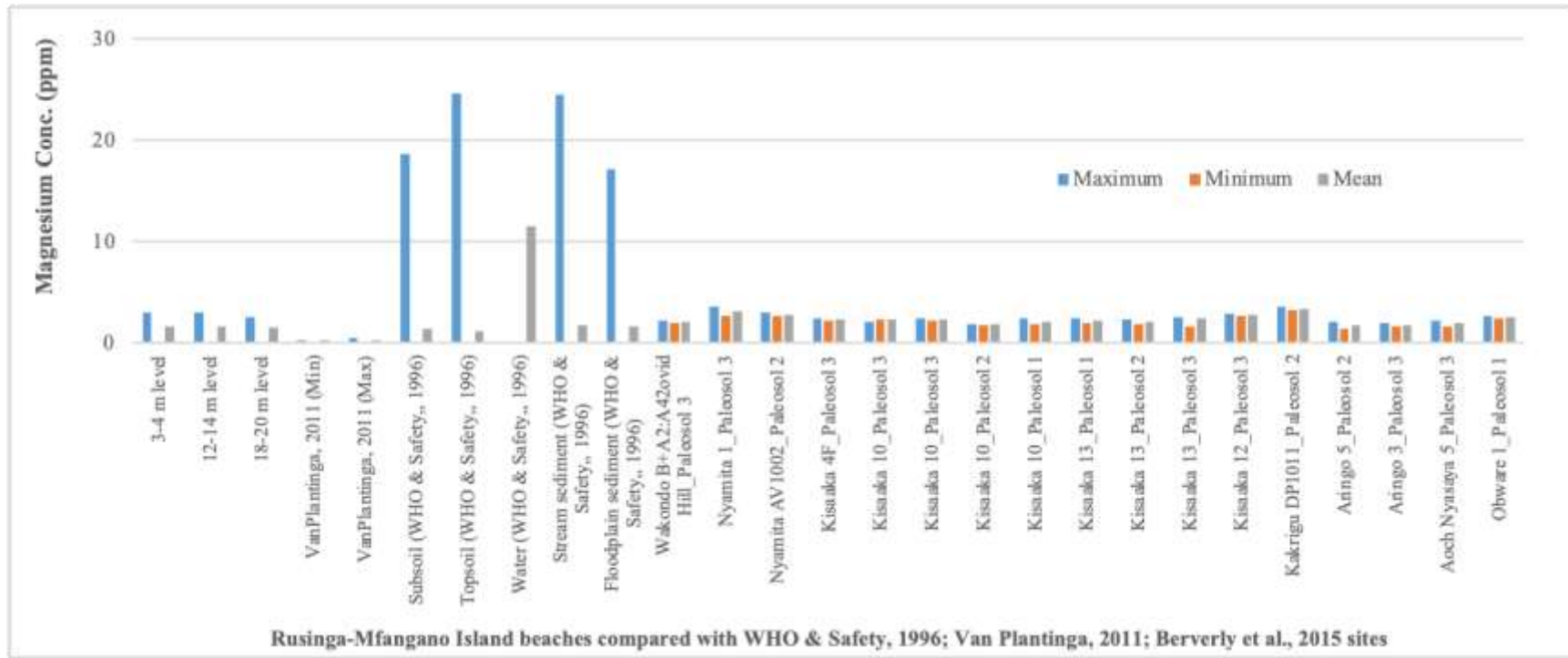


Figure 6. Bulk sediment geochemistry evaluation for magnesium concentrations (ppm) for beaches levels 3-4 m, 12-14 m & 18-20 m of Rusinga-Mfangano Islands, compared with WHO & Safety, 1996, Berverly et al., 2015 and Van Plantinga, 2011 sites

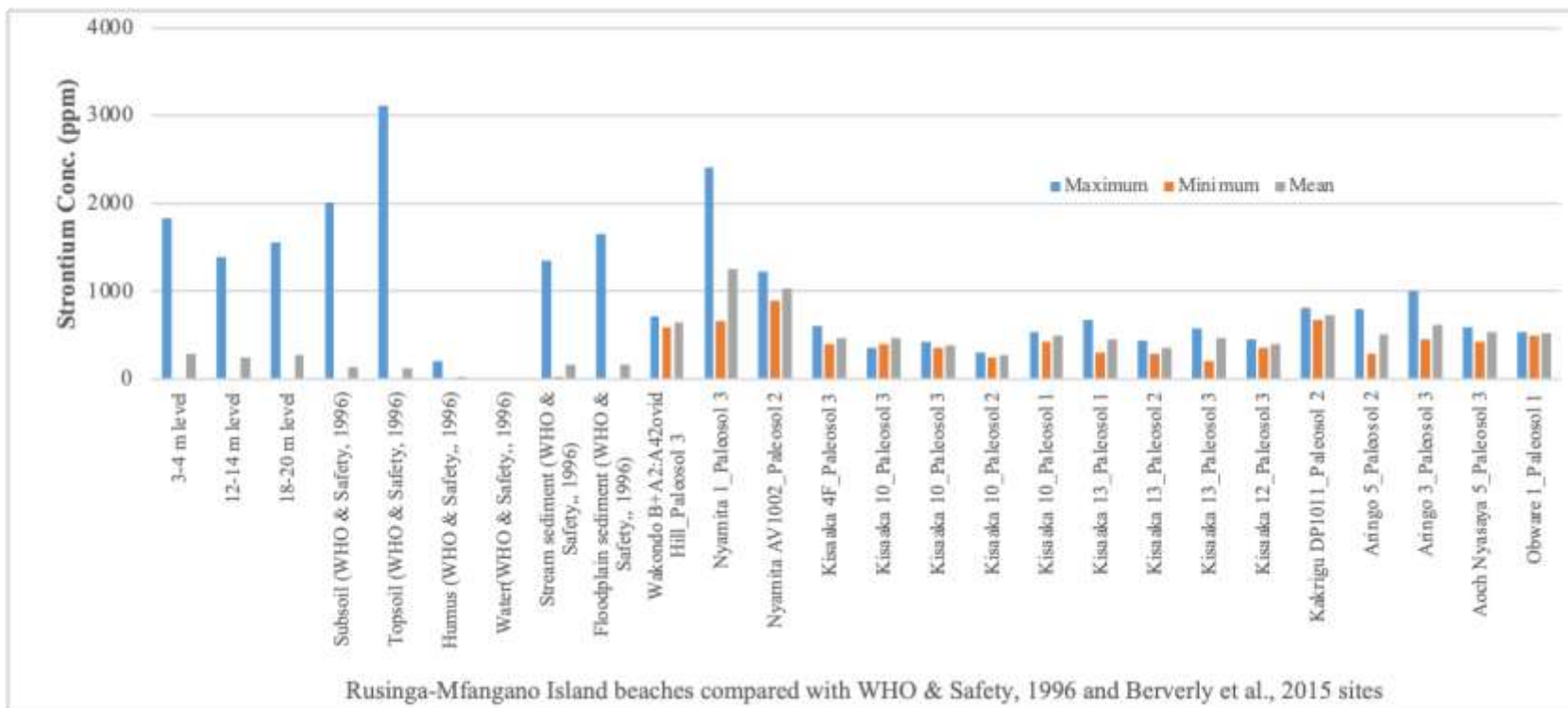


Figure 7. Bulk sediment geochemistry evaluation for strontium concentrations (ppm) for beaches levels 3-4 m, 12-14 m & 18-20 m of Rusinga-Mfangano Islands, compared with WHO & Safety, 1996 and Berverly et al., 2015

References

- (WHO), W. H. O., & Safety, I. P. o. C. (1996). Guidelines for drinking-water quality. Vol. 2, Health. In (2nd Ed ed., pp. 973p.): World Health Organization.
- Adamson, D. A., Gasse, F., Street, F. A., & Williams, M. A. J. (1980). Late Quaternary history of the Nile. *Nature*, *288*, 50-55. <https://doi.org/10.1038/288050a0>
- Augustine, A. (2009). Irrigation Suitability Assessment of Effluents From West Kano Rice Irrigation Scheme, Kisumu, Kenya. *Ethiopian Journal of Environmental Studies and Management*, *2*.
- Beverly, E. J., Peppe, D. J., Driese, S. G., Blegen, N., Faith, J. T., Tryon, C. A., & Stinchcomb, G. E. (2017). Reconstruction of Late Pleistocene Paleoenvironments Using Bulk Geochemistry of Paleosols from the Lake Victoria Region [Original Research]. *Frontiers in Earth Science*, *5*. <https://doi.org/10.3389/feart.2017.00093>
- Brooks, J. L. (1950). Speciation in Ancient Lakes (Concluded). *The Quarterly Review of Biology*, *25*(2), 131-176. <https://doi.org/10.1086/397539>
- Butzer, K. W. (1980). Adaptation to Global Environmental Change. *The Professional Geographer*, *32*(3), 269-278. <https://doi.org/10.1111/j.0033-0124.1980.00269.x>
- Campbell L.M, Hecky R.E, Muggide R, Dixon D.G, & P.S, R. (2003). Variation and distribution of total mercury in water, sediment and soil from northern Lake Victoria, East Africa. *Biogeochemistry*, *65*, 195-211.
- Campbell, L. M., Hecky, R. E., Nyaundi, J., Muggide, R., & Dixon, D. G. (2003). Distribution and Food-web Transfer of Mercury in Napoleon and Winam Gulfs, Lake Victoria, East Africa. *Journal of Great Lakes Research*, *29*, 267-282.
- Gasse, F., Rognon, P., & Street, F. A. (1980). Quaternary history of the Afar and Ethiopian Rift lakes. *cabdirect.org, ref.4pp*, 361-400.
- Gillespie, R. F., Street-Perrott, F. A., & Switsur, R. (1983). Post-glacial arid episodes in Ethiopia have implications for climate prediction. *Nature*, *306*, 680-683.
- Grove, A. T., F, A. S., & Goudie, A. S. (1975). Former Lake Levels and Climatic Change in the Rift Valley of Southern Ethiopia. *The Geographical Journal*, *141*(No. 2), 177-194.
- Hecky, R. E., & Degens, E. T. (1973). *Late Pleistocene - Holocene Chemical Stratigraphy and Palaeolimnology of the Rift Valley Lakes of Central Africa* (WoodsHole,Massachusetts 02543, Issue. <https://dx.doi.org/10.1575/1912/4362>
- Hem, J. D. (1985). *Study and interpretation of the chemical characteristics of natural water* (Vol. 2254).
- Hill, T. P., Werner, M. A., & Horton, M. J. (1967). *Chemical composition of sedimentary rocks in Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, and Wyoming*. <http://pubs.er.usgs.gov/publication/pp561>
- Johnson, T. C., Scholz, C. A., Talbot, M. R., Kelts, K., Ricketts, R. D., Ngobi, G., Beuning, K., Ssemmanda, I. I., & McGill, J. W. (1996). Late Pleistocene Desiccation of Lake Victoria and Rapid Evolution of Cichlid Fishes. *Science*, *273*(5278), 1091-1093. <https://doi.org/10.1126/science.273.5278.1091>
- Kabata-Pendias, A., & Pendias, H. (2000). *Trace Elements in Soils and Plants*.
- Kasedde, H., Kirabira, J. B., Bähler, M. U., Tilliander, A., & Jonsson, S. (2014). Characterization of brines and evaporites of Lake Katwe, Uganda. *Journal of African Earth Sciences*, *91*, 55-65. <http://dx.doi.org/10.1016/j.jafrearsci.2013.12.004>
- Kayombo, S. (2006). Lake Victoria Experience and Lessons Learned Brief.
- Kayombo, S. J., S.E. (2006). Lake Victoria. In S. E. Jorgensen (Ed.), *Experiences and Lessons Learned*.

- Kendall, L. R. (1969). An Ecological History of the Lake Victoria Basin. *Ecological Monographs*, 39(2), 121-176. <https://doi.org/10.2307/1950740>
- Kent, P. E. (1942). The Country Round the Kavirondo Gulf of Victoria Nyanza. *The Geographical Journal*, 100(1), 22-31. <https://doi.org/10.2307/1789231>
- Kilham, P. (1979). *Biogeochemistry of African Lakes and Rivers* Duke University, Durham, North Carolina].
- Kulp, L. J., Turekian, K., & W, B. D. (1952). Strontium Content of Limestones and fossils. *GSA Bulletin*, 63(7), 701-716. [https://doi.org/10.1130/0016-7606\(1952\)63\[701:Scolaf\]2.0.Co;2](https://doi.org/10.1130/0016-7606(1952)63[701:Scolaf]2.0.Co;2)
- Mboya, B. (1983). The genesis and tectonics of the N.E. Nyanza rift valley, Kenya. *Journal of African Earth Sciences* 1(3), 315-320. [https://doi.org/10.1016/S0731-7247\(83\)80016-0](https://doi.org/10.1016/S0731-7247(83)80016-0)
- Odada, E. O., Olago, D. O., Bugenyi, F., Kulindwa, K., Karimumuryango, J., West, K., Ntiba, M., Wandiga, S., Aloo-Obudho, P., & Achola, P. (2003). Environmental assessment of the East African Rift Valley lakes. *Aquatic Sciences - Research Across Boundaries*, 65(3), 1015-1621. <https://doi.org/10.1007/s00027-003-0638-9>
- Odada, E. O., Scholes, R. J., Noone, K., Mbow, C., & Ochola, W. O. (2008). *A strategy for Global Environmental Change Research in Africa. Science Plan and Implementation Strategy*. <http://hdl.handle.net/11295/49164>
- Okungu, J. O., Rutagemwa, D. K., Ssenfuma-Nsubuga, M., Abuodha, J. O. Z., Mwanuzi, F. L., Muyodi, F. J., & Hecky, R. E. (2005). *The changing water quality of Lake Victoria; current conditions, trends and required action*. (Lake Victoria Environment Management Project (LVEMP) Water Quality and Ecosystem Status: Lake Victoria Regional Water Quality Synthesis Report, Issue. L. V. E. M. P. (LVEMP).
- Onyari, J. M. (1985). *The concentration of Mn, Fe, Cu, Zn, Cd and PD in sediments and fish from the Winam Gulf of Lake Victoria and fish Drought in Mombasa town markets* University of Nairobi]. Nairobi.
- Onyari, J. M., & Wandiga, S. O. (1989). Distribution of Cr, Pb, Cd, Zn, Fe and Mn in Lake Victoria sediments, East Africa. *Bulletin of Environmental Contamination and Toxicology; (USA)*, 42:6, Medium: X; Size: Pages: 807-813 2016-2005-2016. <https://doi.org/10.1007/bf01701619>
- Opiyo-Akech, N., Tarney, J., & Hoshino, M. (1999). Petrology and geochemistry of granites from the Archæan terrain north of Lake Victoria, western Kenya. *Journal of African Earth Sciences*, 29, 283-300.
- Organization, W. H., & Safety, I. P. o. C. (1996). Guidelines for drinking-water quality. Vol. 2, Health. In (2nd Ed ed., pp. 973p.): World Health Organization.
- Peppe, D. J., McNulty, K. P., Cote, S. M., Harcourt-Smith, W. E. H., Dunsworth, H. M., & Van Couvering, J. A. (2009). Stratigraphic interpretation of the Kulu Formation (Early Miocene, Rusinga Island, Kenya) and its implications for primate evolution. *Journal of Human Evolution*, 56(6), 447-461. <https://doi.org/10.1016/j.jhevol.2009.02.006>
- Piper, B. S., Plisnton, D. T., & Sutcliffe, J. V. (1986). The water balance of Lake Victoria. *Hydrological Sciences Journal*, 31(1), 25-37. <https://doi.org/10.1080/02626668609491025>
- Ramsey, B. C. (2009). Bayesian Analysis of Radiocarbon Dates. *Radiocarbon*, 51(01), 337-360. 10.1017/S0033822200033865
- Ramsey, C. B. (2017). Methods for Summarizing Radiocarbon Datasets. *Radiocarbon*, 59, 1809 - 1833.
- Reimer, P. J., Brown, T. A., & Reimer, R. W. (2004). Discussion: Reporting and Calibration of Post-Bomb 14C Data. 46(3), 1299 - 1304. <https://doi.org/10.1017/s0033822200033154>
- Simmons, E. C. (1999). Strontium: Element and Geochemistry. In C. P. M. a. R. W. Fairbridge (Ed.), *Encyclopedia of Geochemistry* (pp. 598-599). Kluwer Acad., Dordrecht, Netherlands.

- Street-Perrott, F. A., & Harrison, S. P. (1985). Lake Levels and Climate Reconstruction. In A. D. Hecht (Ed.), *Paleoclimate Analysis and Modeling* (pp. 291-331). John Willey & Sons.
- Street-Perrott, F. A., & N, R. (1983). Fluctuations in closed-basin lakes an indicator of past atmospheric circulation patterns. In A. StreetPerrott, M. Beran, & R. Ratcliffe (Eds.), *Variations in the Global Water Budget* (pp. 331-345). Dordrecht: ReideL.
- Street, F. A., & Grove, A. T. (1979). Global Maps of Lake-Level Fluctuations since 30,000 yr B.P. *Quaternary Research*. [https://doi.org/10.1016/0033-5894\(79\)90092-9](https://doi.org/10.1016/0033-5894(79)90092-9)
- Stuiver, M., Reimer, P., & Reimer, R. (2005). *CALIB 5.0.2 [WWW program and documentation]*. <http://calib.org> accessed 2019-4-5
- Talbot, M. R., & Lærdal, T. (2000). The Late Pleistocene - Holocene palaeolimnology of Lake Victoria, East Africa, based upon elemental and isotopic analyses of sedimentary organic matter. *Journal of Paleolimnology*, 23, 141-164.
- Talling, J. F., & Talling, I. B. (1965). The Chemical Composition of African Lake Waters. *International Review of Hydrobiology*, 50, 421-463.
- Tryon, C. A., Peppe, D. J., Tyler Faith, J., Van Plantinga, A., Nightingale, S., Ogondo, J., & Fox, D. L. (2012). Late Pleistocene artefacts and fauna from Rusinga and Mfangano islands, Lake Victoria, Kenya. *Azania: Archaeological Research in Africa*, 47, 14 - 38.
- Van Couvering, J. (1972). *Geology of Rusinga Island and Correlation of the Kenya Mid-Tertiary Fauna* St. John's College, Cambridge University].
- Van Plantinga, A. A. (2011). *Geology of the Late Pleistocene artifact-bearing Wasiriya Beds at the Nyamita locality, Rusinga Island, Kenya*. Baylor University]. Unpublished Thesis.
- Wayland, E. J. (1931). *Report of a geological reconnaissance in South Kavirondo*.
- Welcomme, R. L. (1972). A brief A brief review of the floodplain fisheries of Africa. *Afr. J. Trop. Hydrobiol*, 1, 67-76.

Effects of Religious Practices on Utilization of Maternal Health: A Qualitative Study among the Luo Nomiya Church Faithfuls in Siaya County, Kenya.

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ABSTRACT

Religious practices are prevalent amongst the many communities in developing countries. This was a qualitative explorative study. It employed a phenomenological approach to collect data. 22 mothers of childbearing age were included. Seclusion, massaging the women during pregnancy, and the use of traditional herbs during pregnancy, birth and after birth affect women's utilization of maternal healthcare services. These findings offers a new dimension to understanding how community practices impact on the utilization of maternal health services. Attending to the complex environments in the context of the study, involving the church and healthcare workers in the care of the mother will help establish a relationship and promote health utilization behaviour. Thus stakeholders, the church, the public health providers and policy makers should work together to come up with interventions and policies to tackle the dynamic retarding practices.

Key words: Religious Practices, Utilization, Maternal Health Services

Introduction

Globally, approximately 830 women died during and following pregnancy and childbirth daily in 2015.^{1,2} Approximately 99% of all maternal deaths occur in developing countries. Despite increasing interventions, between 1990 and 2015, global maternal mortality rate declined by only 2.5%.^{1,3} Gaining on Maternal health (MH) crucially requires that women must have access to quality care before, during and after childbirth.¹

Studies have shown that women especially in sub-Saharan Africa need to overcome numerous social barriers to access maternal health care.³ Despite social change and modernization,⁴ people still strongly adhere to their local practices that are crowded with misconceptions on

causes of maternal mortality.⁵ Indigenous African spirituality involves deeper human values, attitudes and practices which arise from experiences articulated and lived in the African context.⁶ Religious practices contribute to poor statistics and dismal performance on maternal health statistics and are least studied.^{7,8,9} The real challenge today for many people today is balancing religion and health, finding ways of achieving harmonized and holistic health programs as well as uptake of modern healthcare services, and investing in women's reproductive health.^{12,13,14}

Christian following in Africa today stands at 57%, and in Kenya the following stands at 85.52% of the total population. Indigenized churches richly subscribe to Christian devotion and comprise approximately 15% of the country's

population.^{15,16} These churches have been cited to influence the utilization of healthcare services.^{8,9} Nomiya church, Legio Maria (Legion of Mary) church, Roho (Spirit), Dini ya Musambya, Akorino and the Kavonokya churches especially have been markedly known to have unconventional health seeking behaviours and oppose utilization of modern medicines.¹⁷

Nomiya church was established with and still has unique attuning to the natives traditions, needs and aspirations with the church maintaining most of their key cultural practices that was not allowed by the European colonial Christian missions.¹⁹ The introduction of the indigenous Luo Nomiya church among the Luo made it become a total way of life.²⁰

Kenya did not achieve her millennium development goals (MGD) 2015 targets,^{21,22} despite numerous interventions and concerted efforts by partners to improve maternal health. Maternal mortality ratio in Siaya stands at a significantly high of 691 deaths per 100,000 live births,²³ against the national MMR rates at 362/100,000 live births, rates significantly expressing the epidemic. The county is among the top ranking 15 counties accounting for 98.7% of the total maternal deaths in Kenya.^{24,25}

The dynamics of the relationship between folks in the community especially between a woman and her close links can affect her control over resources, decisions, access and uptake of health services. In rural communities religious and social links are extremely intertwined, mothers learn by observing what senior members do. Older women influence young women's behavior to utilize or not utilize maternal health services. Previous surveys have underscored and quantified the facts to the high maternal mortality rates in the region. Few qualitative researches have been done on the religious practices and their public health impacts on women's health. This may signify the

need to consider investigating the 'how,' 'why' and 'what' factors affect utilization of maternal health services, most of which cannot be assessed using statistical tools, leaving a gap in the in-depth knowledge known about how the practices affect uptake of maternal health services. This study examined the religious practices affecting utilization of maternal health services by Nomiya church faithful in Siaya County, Kenya. The findings aimed to provide essential information to the county, national governments and the partners to help improve utilization of maternal health services especially among the African Spiritual communities.

Materials And Methods

Study design and Setting

This qualitative explorative study was conducted from July 2019 to December 2019 involving 22 in-depth interview participants. The study participants were women of prime reproductive age who were either pregnant or with under five year old children and worshipping in Nomiya church in the County of Siaya.

Consenting process

The researcher gained entry into the community of faithful's by reaching out to one of the Bishops of the Nomiya church, who was briefed on the objectives of the study and agreed to let the church community take part in the study geared towards improving maternal health status of the faithfuls. The bishop then directed the researcher to the women leader of the church to link me with the right study participants within Nomiya church community. A participant must have been a member of the church for at least 2 years, was either pregnant or is a mother of an under 5-year nold child. Participant's selection was achieved by the snow balling technique, where the participant interviewed last would lead the researcher to the next participant.

With every in-depth interview participant, a meeting with the participant

to create rapport was done to enable scheduling of the interview session. During this meeting, the participant was informed of the study objective, briefed of her role in the study and, how data will be collected and handled. On the scheduled interview date, a visit to the client at her desired time and place was observed. The participant was assured of confidentiality, consent sought and risks explained. A written or verbal consenting was sufficient to allow a participation in the study.

Data collection

Twenty-two (22) in-depth interviews (IDI's) were done, with data on participants lived experiences collected using IDI guides. Sample size targeted 28 IDI participants. Saturation was reached at the 12th participant.

Seven key informant interviews were done and data collected using KII guides for their expert opinion of the topic. A focused group discussion was conducted using an FGD guide, to provide more insights on the topic. Digital recorders were used to record the data.

Data management and analysis

Data was downloaded from the digital recorders and stored in password protected folders on a study computer. A copy of the data was backed up in a flash drive stored off site. Only authorized staff had access to stored data for confidentiality reasons. Audio files were transcribed and translated into English. The resultant transcripts were uploaded into Nvivo V12 package for data analysis. The analysis began by 2 coders reading through the first 3 transcripts and coming up with a coding structured based on phenomenological approach. Each interviewer developed the codes and sub-codes under each theme that were compared across coders for concurrency. Discrepancies were discussed and harmonized before the final codebook was applied to the conscripts and inter-coder reliability assessed and any differences in the application of the codes resolved.

Thematic content and discourse analysis approach was used to identify the patterns of dominant themes and relationships between themes.²⁶

Results

The emerging themes included;

Seclusion, Massaging the Pregnancy, Wife inheritance, and Organizational practices.

'KENO': SECLUSION AS A PRACTICE

'Keno' translated as '**Seclusion**' is a practice where the mother and child are kept inside the house without coming out of the house for 33 days for boys and 66 days for girl child, in observation of church rules.

All the 22 informants said that they practice seclusion as it is;

"an order practiced by the Nomiya community as a directive from God to them as found in the book of Leviticus chapter 12 more is in Genesis 17."(IDI_013_NCM)

While observing the principles of seclusion, the mother is considered '*mo gak*' meaning 'unclean', and;

"until you finish the required regulations ... until the bleeding stop, then you shave the child, and they come and pray, cleansing you, that's when you are allowed to go to church." (IDI_008_NCM)

"The mother has to 'keep herself pure' while in seclusion. There are foods the family can't eat..." (IDI_010_NCM)

i. Terms of seclusion

Previously once you had given birth, you were put indoors and you were not allowed to greet any person and people were not allowed to enter into that house even if it was a visitor. Meaning a visitor may have communicable disease and through greetings they believe the visitor is unclean. (KII_005_N_NCM)

A key informant a senior nursing officer worshipping in Nomiya church, opted out of this practice and did not observe the

requirements of seclusion practice explained that;

I didn't opt in to be kept in the house. There are people who are not able to stay in the house ... that one is like Psychological torture. I have never been in the house for more than two weeks. I was not ready to be in isolation.
(KII_005N_NCM)

ii. Seclusion and health seeking behaviour

Leaving the house during seclusion to go to the health facility was a thorny issue for the members to overtly share about. Some members were positive to leave their seclusion customs to go for health care services. A member reported that;

Our church does not prohibit anyone from going to pick their drugs. You can leave the baby with another little child. You are not allowed to go anywhere with the newborn ... you can meet with someone who is not clean.
(IDI_010_NCM)

Some members reported that they are not allowed to leave the house for whatsoever reason until the seclusion period is done. The church community will ensure as IDI_009_NCM reported that *"if there is any problem, they can help you and help the child too."*

I think they are following some biblical message ... I think it does some good to the health of the mother. When you exclude that mother from social interaction ... I think you are preventing a lot of infections to this mother.
(KII_001_SCH)

A FGD participant confirmed that when a child's mother is subjected to seclusion, then the church codes must be observed to the letter.

"As the one I just told you about was delivered in the hospital then later on I heard that the child is kept, and no one can take the child anywhere."(FGD_001_CHV)

iii. End of Seclusion Period – Rites and Teachings.

While exploring the happenings around the closing of the seclusion period which is after 33 days for boys and 66 days for a girl. A member reported that on that day

"we play drums, run dancing on the roads, it is such a big celebration."(IDI_002_NCM)

"they come and pray, cleansing you, that's when you are allowed to go to church. That's when you can come out of seclusion."(IDI_008_NCM)

As a cherished practice and of particular to all members, prioritized during the break of seclusion period, a participant reported that the leaders use this time to hammer their war against contraceptives use reporting that;

... when they come to the ceremony to break the seclusion period when the days are done, they really preach against Family Planning so viciously, hitting at those who go for them so much that if using any method you feel the guilt deep within you.
(IDI_010_NCM)

In realization of this religious event during the break, the faithful practice the rite of *'kalo nyathi'* translated literally as 'crossing-over the baby' or an event marked by 'shaving of the child' as a rite, is celebrated to mark to the end of seclusion.

"It is said the father will unite in the bed with the mother. That is the meaning of the ritual."(KII_003_B)

This is an important custom that impacts the reproductive health of the women. Another key informant opined that;

They have their beliefs that they try hide on the child not becoming fat, 'shaving the child', 'crossing over the child', all those things. They just rush for sex after delivery. The episiotomy sutures will be coming off, in the name of you want 'the rite' to be fulfilled, you wonder! If you have not done it, this lady is

going to bewitch herself.
(KII_007_C_NHC)

Regarding these practices a key informant, and a County coordinator opined that;

We keep on renewing messages time and time again to handle the new challenges that come on board. The information you will get at the action you think that is happening is actually totally different ... Information, education and communication messages

should always be on a dynamic trend ... You know culture is dynamic. You will find that when they are shifting from a behaviour then they are going to the next.
(KII_002_CH)

CHV's unanimously reported that seclusion happens in the community; *"this issue of seclusion, mmh, it has surely disturbed me. Religion still poses as a big problem, eeh! A big problem to us. People don't go to the hospital, yes, those are their regulations too."* (FGD_003_CHV)

Figure 1: Tree map illustrating Seclusion as mentioned by the faithful



Seclusion was widely mentioned by the faithfuls. It is a significant practice that impact on various spheres of lives of the faithful as family planning, nutrition, sexual health, association and prayer life and as such many were passionate and identified with the practice.

Massaging Pregnant Women

All the 22 participants believed in this practice of abdominal massage during pregnancy to help ease abdominal and pelvic pains. Of the 12 participants sampled for an in-depth analysis on this theme, eight (8) participants reported that they either utilized the services during their last pregnancy or in the current pregnancy.

Regarding care during pregnancy as observed by the church, a member reported that

"When a mother is pregnant, there is a way in the church we want her to care for her-self."(IDI_004_NCM)

"we don't have a hospital midwife but the ones from Nomiya church,"(IDI_010_NCM)

"they prohibited foods that when a

mother eats, the baby grows big, they don't allow such foods. They do the massage in church by wife of the church pastor and she usually uses Deepak and heated water.” (IDI_007_NCM)

Massage can be done at the convenience of the mother;

“They do massage in the church, and after the massage at times I feel great, the massage can be done even here at home.”(IDI_009_NCM)

“Massaging is like an exercise ...So the massage makes them feel just like that.” (FGD_001_CHV)

When you arrive at her place you explain to her about your issue, then you kneel down at the altar, then you open up your clothes exposing your abdomen, take a little oil with your finger and you apply on your abdomen [demonstrating on her abdomen how it is done], then she massages as she shakes the baby. She then collects the contents holding them bringing them to the middle, while shaking the tummy then it's done. (IDI_008_NCM)

When being massaged, they massage even the thighs, those offering the service claim it is a God given gift. As they do it, they can tell you that the child not lying well in the womb, and the ladies will not be feeling well in the body. And after the visit, she says she is feeling lighter. (FGD_004_CHV)

Comparing the services offered by their traditional care givers to the one received at the hospital, the environments and understanding they get, a participant reported that;

When you lie on your side, it will be difficult to massage the whole abdomen. And if you lie on your back, your tummy disappears, but if you kneel down then the exposure of the abdomen is great,

this is at 6 months of pregnancy. At the hospital they just do their tests on you ... No massage is done! That is not done at the hospitals. (IDI_007_NCM)

Compounding the challenge to utilization of HC services, the traditional therapists further have prescriptions for problems during pregnancy, as narrated by a faithful that;

To treat abdominal pains, sometimes, I have seen them give traditional medicines for one to chew, there are those she [women leader] comes with. At times she comes with boiled water mixed with candle wax. And she gives you this to drink with lemon water and ginger. (IDI_009_NCM)

During the focused group discussion, participants unanimously agreed that traditional medicines are still being used by the mothers.

“Yes they are there. Especially there are those that are chewed to help give birth without labour pain.” (FGD_004_CHV)

I reached there only to find the lady in a pool of blood. The child was lying on the bloody floor. After cutting the umbilical cord, I informed them that we are taking the lady to the hospital. But the lady retorted back that her mother in-law has gone to bring some herbs, as another one I used before has failed. Just leave me, it will just come out, they have gone to bring another medicine. (FGD_002_CHV)

The Practice of Wife Inheritance Among the Faithfuls

Six of the respondents strongly believed and would observe this practice, three reported that they know but may not observe its strict requirements, as 2 respondents observed that the practice is not mandatory today.

Wife inheritance is a worthy practice that is important, a participant stated that;

“if my husband dies, I can surely be inherited, I cannot lie about it, because my husband has died when am still young.”(IDI_010_NCM)

Her main motivation being that the inheritor

“build me my own compound, he must go to our home and pay my dowry ... Even the bible supports you be inherited.”(IDI_010_NCM)

i. Impacts of the Inheritor to the family

Economically he can't even buy clothes or food. He should be taking care of the children he brings forth, but, you find that he has so many kids at his home, he comes to this new lady and give birth to so many kids with her, and they don't even own a piece of land, this will only bring poverty. (KII_004_C_NCM)

“Yes, wife inheritance would lead to HIV/Aids and STI's. Inheritance also brings children that people we are not prepared for.” (KII_007_C_HCW)

These wife inheritors, dealing with all of them is not easy. You will find that today he is inheriting this lady, the next day he is going to another. They normally put conditions! Okay, about food ...

you find that the man is served more than anyone in quality and quantity. These things happen, yes, in nearly all the homes, but it is done in secrecy. (KII_004_C_NCM).

ii. Consequences of refusing the practice

In whatever state a woman is, whether pregnant or not, a participant asserted that;

If you refuse, that can be a terrible disaster and a big omen may befall the first born or the last born. First, to inherit a woman, then the small and big children must be around. It is demanded that you cook some food that they will eat together, to 'set them free in this house' as a rite, setting free the new. (IDI_004_NCM)

Participants in the focused group discussion unanimously agreed that the practice is still being practiced but under different terms;

In the community sittings they would pick one of them and direct him to go take care of the brother's house. Today it is the woman who can decide to be remarried. So, it is her sole responsibility to choose whether or not to get a new partner. (FGD_003_CHV).

Community Organizational and Practices

Men's Role in Maternal Health

Table 1. The perception of women regarding gender role during pregnancy and child birth

Theme	Code	References
Gender role	Take the women to hospital	<ul style="list-style-type: none"> • Men ensure that the wife is well fed ... that there is no any communicable disease. They work hard to make sure there is enough money during that period.” (IDI_006_NCM) • I just think, it's just being with her, take her to the clinic especially the first time you must sit there and wait. (IDI_011_NCM) • First time you must sit there and wait. (IDI_002_NCM) • You know when labour pain starts you won't know where you are. At that time, do you even talk? [Laughs] The child's father will take you; you won't know that you could have reached there at what time. (IDI_008_NCM)

All the 22 participants said that gender role during pregnancy and at birth do impact on the health of the mother. Women felt that men should take them to the hospital, provide for them especially during pregnancy and after birth, and protect them from unwanted diseases.

b. Church practices that affect maternal health

Marriage systems and relationship networks in the church are made complex by the activities of the church. During church services, songs, playing of drums and dances especially at night are of concern.

Being that we are Luo's and our church traditions has much fun. At times people dance, and we also have celebrations, and it goes till night, and at night, dancing brings love, this is when they become promiscuous. (KII_005_N_NCM)

The bishop is allowed to have at least 6 wives, but he cannot satisfy most of them. So, within the church you will find that there are some other people who are helping bishop to manage these ladies to be satisfied sexually. (IDI_004_NCM)

c. Community practices involvement in Maternal Health

The income of these people is organizations not really good ... I met a sick woman carrying a baby, and she was carrying a small sack of maize on her head that she wanted to sell so that she could go to the hospital, have some money to buy drugs if prescribed and even have motorbike fare from here, it's a far distance. So, one can even die while waiting to get money to go with to hospital. (IDI_004_NCM)

Some church members were involved with some community organizations. When a member needed health services from the community organization, a participant narrated that

"groups have rules, you can't just go there and get help [Laughs]. They cannot help unless you go to the ward and is admitted in

there, in that case, there is a constitution clause that allows ... that you to get money."(IDI_010_NCM)

Discussion

Seclusion as a practice keeps the mother and young child from possible interaction with outsiders from the community who may be carrying infectious pathogens that may easily affect them, knowing that their immunity about this period is still weak. Seclusion binds the mother not to leave her house. This is a covenant that the mothers must bear alone as religion dictates. The confinement prevents the mothers from going to church, markets, peer meetings nor to seek medical care for chronic and acute conditions.¹⁰⁻¹² While seclusion on one end may protect the mother from potential contact to infectious agents, on the other hand it is a possible barrier to the utilization of maternal health services as mothers believe it is a holy period with no infections nor health conditions to affect them at these periods.

Regulations regarding some foods are strictly adhered to just as is observed in pregnancy. Mothers are not allowed to eat carcasses from dead animals whose cause of death are not known. This belief has a positive bearing on protecting the mother from acquiring zoonotic infections which are eliminated by these practices.

Utilization of healthcare services come in late after seclusion practices and rites have been observed. When the mother is taken in for seclusion, she is believed to remain clean and healthy, as the 'bad airs' that cause disease cannot affect those in seclusion. In contrast, it is worth mentioning that early detection and diagnosis of chronic conditions after delivery as vesico-vaginal fistula, peuperial psychosis and other conditions may be delayed. This is a key period in the woman's life where near misses may lead to devastating results.^{11,14}

While in seclusion, the belief held by the participants that they are safe from ill health acts as a predisposing factor affecting utilization of maternal health services.

No participant reported that they got sick during seclusion. Many believed that this is a period of purity, dedication, and dwelling in divine protection of God. But in case one got sick, she was taken care of by the church system, and over-the counter drugs bought for the member, limiting contact with skilled maternal health providers. Similar practices in northern Nigeria, revealed that seclusion is believed to have a compounding effect on the high maternal mortality.^{7,11}

Strict observation of seclusion practice may lead to a rise in viral load, opportunistic infections (OI's) amongst those mothers who are HIV positive. Mortality, MTCT of HIV may increase. Leaving the newborn baby with another child to go to the hospital is a risky affair no woman may dare, as she may delay at the hospital waiting to be served impacting utilization of maternal health services after birth,⁸ this is a barrier factor in this study and limits women from seeking and utilizing health services.

Celebrations held to mark the end of seclusion act as a predisposing factor affecting utilization of maternal health services. This event has a bearing on reproductive health. After the break, the couple must practice the 'crossing over the child,' rite. If that is not done, the mother will remain in bondage and unclean. The rite is marked by sexual union with the father of the child. This time is crucial in a mother's reproductive health, marking the return to active sexual relations, while most of the faithful may not strictly adhere to exclusive breastfeeding and are hesitant to use FP services leaving chance to a possibility of pregnancy and transmission of STI's in the polygamous unions.⁴ Multi-parity predisposes the mother to risks of mortality.

During the breaking from seclusion,

parishes from far places send representatives. These events have a bearing on pregnancies, contraceptive use, spread of HIV/AIDS and STI's, which have not only become issues of great maternal health concern, but also a PH issue. Seclusion has a bearing on the utilization of maternal health services especially among the females who are the majority of adult worshippers. Preaching against the contraception presents as a barrier factor, which has a negative impact on maternal health. Formulating messages that can address the practice can help develop policies that can help address similar problems in the community. Concerted governments, stakeholders and health promotion expert's strategic conventions targeting the practices can help in advocating for behaviour change in the community.

The church is the highest family unit as one member hinted. During illness, when funds are needed to pay hospital bills, the church members collectively raise money to help their sick member, but this is only when the cases have become very severe. Disease prevention plans in this community is wanting. Faithful's intervention plans during illness act as a predisposing factor affecting utilization of maternal health services and would encourage use of alternative care services.^{7,14,17}

Herbs were used to treat some maternal conditions and in the care during labour. Mothers conform to and identify with those offering alternative services at the community. But these practices are retrogressive, unregulated and present as unique barriers to utilization of maternal health services in that, mothers put all their hopes in the local prescriptions and ignore seeking conventional maternal health services.^{7,17} The handling by the traditional therapists poses a great challenge to the handling mothers receive the health facilities.¹¹ The massage leaves them feeling

good, relieved, relaxed, sleepy and also got assurance that the child has been turned to the right position in the womb a factor affecting utilization of maternal health services.

The fear of taking pills taken during pregnancy, beliefs on the cleansing power of the herbal medicines, mother-in laws and church leaders care decision stressing and holding onto traditional norms, are complex interactions creating barriers to utilization of maternal health services.^{4,9} Mothers have little to do but follow the instructions given by their seniors.

Comparing the care given by the religious system to the ANC program, the faithful reported that during the ANC visit, there is no abdominal massage done. The women church leaders have mastered their practice of abdominal massage which is accepted by the mothers. Massaging the pregnant is a barrier factor to the utilization of maternal health services. This makes the faithful's less inclined to use ANC services.¹ At the hospital, HCW ask them to lie on their back, which most women believe makes the abdomen to reduce in size not giving the right fullness and examination report, unlike when kneeling down.^{4,5} HCW's should develop information to address these believes.

TBA's caring during pregnancy vaguely make mothers assume a false sense of wellness, that all is fine with their pregnancy, silent communicable and non-communicable conditions may creep-in and complicate a pregnancy, as with anemia, pre-eclampsia or gestational diabetes.^{1,24} Preference to TBA massage present as a barrier factor with the fear of taking pills presenting as a predisposing factor to utilization of maternal health services. According to the Andersen model, accessibility, affordability and acceptability of the TBA services in external environments influences the choices women

make impacting utilization of maternal health.^{3,8}

Healthcare workers ought to learn and know about these traditional procedures and community's attitude towards healthcare services.⁹ Understanding their practices can help plan for individual and community-based health education messages targeting the practices, the community concept of disease, and management of the conditions, and not criticizing them. Stereotyping and criticizing community's ways should be avoided,²⁰ if we wish to gain on utilization of maternal health.²¹ Use of traditional medicines presents as predisposing factor, and according to the Andersen model, the external environments where mothers can easily access the local herbs will impact on maternal health negatively.

Communities practice can be considered as good, bad and uncertain. Wife inheritance still runs deep amongst the Nomiya, their hold onto the practice is with an added reverence.^{17,19} Some women regard it high in their priority list, such that should their husbands pass on without fulfilling some of the traditional responsibilities like siring an heir with them, paying bride price, building a house for her and the kids in their land, then this is their other chance to this realization.^{9,11,19}

Wife inheritance has a bearing on maternal health especially in regards to disease transmission with sexually transmitted diseases, HIV and the Human papilloma virus that's responsible for cancer of the cervix. The practice also has a potential to drive families into poverty, posing a challenge to affording, accessing better social amenities as school and HCS among other services.^{3,4,7} So, as much as the women have the chance to choose what they want after losing their spouses, being bound by the church tradition,^{8,9} and subjects to women leaders or mother-in laws, their decisions should be made with great caution,

deserving health counselors input and collaborative approaches. In this study wife inheritance acts as a predisposing factor affecting utilization of maternal health services.

Wife inheritors are usually fed better than any other family member in quality and quantity, whereas the woman should plan to feed herself and the kids, her desire to keep the man overrides others in her program. This may lead to poor maternal health especially during pregnancy, when a woman may deny herself food to feed the man. The inheritor's are usually poor, are not ready to support one family but move from one woman to another, risking women's health by transmitting diseases. They sire many children with the women risking women's life as they don't encourage use of maternal health services. In the Sub-Saharan Africa the risk of death is 30 -80 times higher than in the developed countries, and every pregnancy and multi-parity exposes a woman to the risk of death. Hesitancy to take up maternal services increases the risk to death even more.

Women in polygamy settings give birth to many children to out-do their co-wives. With the poverty prevalent in the communities, mother's may not have time to go to the health checks, wait in the long queue's to be served but opt for nearby alternative local remedies.^{8,9,14} Polygamy, and the levirate practice in this study are predisposing factors that affect utilization of maternal health services.

Having extramarital affairs running in the shadows of the church, coupled with the polygamous nature of the community and the fun-filled church events that run through the nights that include people from far places exposes the women to risks of STI, HIV infection and pregnancy. If one is pregnant, infections especially in the early gestational period, this may predispose one to have an abortion if infections are not

treated. HIV reduces an individual's immunity and so does the pregnancy states. These factors produce a double negative impact towards maternal health.⁹

Men's involvement in caring for the pregnancy scored as an enabling factor leading to good maternal health outcomes. Accompanying the women to the hospital would make them be involved in planning for and utilization of ANC services, protection and prevention against malaria, nutritional needs as well as in planning for delivery and post-natal care. This would make the men become active partners offering emotional and physical support, which never happen.

But the church had laid down some alternative regulations to guide mothers during pregnancy. The men believe it's the co-wives, women leaders and mother's in-law responsibility to take care of the pregnant women. Participants revealed that men were satisfied with their women delivering at home with TBA's help.^{7,9} These restraint habit of men in maternal health limit the ability of woman to take independent decisions about their lives.^{11,12}

If men ensured unhealthy practices are avoided and in case of any abnormal presentation during the pre-natal or post-natal period then skilled care are initiated immediately, maternal health outcomes will improve.^{7,9,11,25} Studies from western Kenya reported that women are less likely to utilize maternal health services as factors fueling that required women to seek for permission to go to hospitals^{9,24} Seeking permission to go to the hospital is a barrier factor which may only encourage utilization of alternative health services which are accessible, affordable and accepted by many maintaining the high MMR.

Similarly, the community organizational frameworks don't support maternal health, neither are their missions nor core values aimed at preventing diseases, but reacting to

extreme health events as reported in cases of admissions only.^{8,11,12} No help comes at the earliest stages of diseases, but calls for help were realized when the sick are admitted into the in-patient care. Admissions only mean the disease is very advanced. This is another form of delay in intervening in maternal health leading to the high mortalities.²¹ Those who needed help to reach the hospital nor got served at out-patient clinics and could not afford to buy medicines prescribed got no help to. This community's organization is a barrier to utilization of maternal health services.

Conclusion and Recommendations

Complex religious practices interact to maintain the high maternal deaths. Seclusion of mothers and their children during puerperium; use of herbs during pregnancy and childbirth; polygamy and wife inheritance even with pregnancy; among other practices may fuel diseases transmission leading to a rise in maternal mortality. Among the Nomiya faithful, the practice of seclusion is almost supreme, has far reaching impacts on maternal health especially family size, utilization of antenatal care, skilled birth and post-natal care services. Massaging the pregnant by the women religious leaders/ TBA's acts as an alternative care to ante-natal care plans.

These practices contribute to maintaining the poor utilization of maternal health services as seen with the low statistics on the 4th ANC visit and rates of skilled birth delivery. The non-supporting men don't take their wives for Ante-natal care services nor skilled birth services.

The faithful's need to be sensitized against unconventional and unnecessary use of drugs as well as local herbs especially during pregnancy and seclusion, practices that make mothers not reach health facilities. Women from the Nomiya church

community's as a potential need factor, must be given the right information for every care services and procedures offered to them especially during pregnancy, childbirth and after birth. The 'how', 'who' and 'when' giving this information must be brought into consideration of the mother's interest. This will help reduce the knowledge gap they have on conventional services and influence their acceptance to use the services.

The faithful's 'hold' onto their practices which are unifying, acknowledged and sacred only endear them to still hold onto them keeping them from utilizing maternal health services. Offering quality maternal health care services is not enough to win the war against maternal mortality. Comprehensive strategies are needed to ascertain and address the multifaceted socio-cultural factors, together with other several barriers highlighted in the Global Health Initiative (GHI) goals as laid out by the government of Kenya to gain on the poor statistics on maternal health maintained in the region and nation at large. The National, County governments and the stakeholders supporting Maternal health services need to:

- i. Understand the other social-cultural deterrents to utilization of maternal health services in the communities and contextualize their impacts;
- ii. Work with the church to 'design with them' plans to contextual women's sexual, reproductive health and rights.
- iii. Train religious leaders, community health assistants and volunteers with the right information, how to relay it, when, and where to deliver it so that mothers can make appropriate decisions regarding utilization of maternal health services.
- iv. Carry out research into HIV-positive pregnant faithful women's health care seeking patterns, delivery practices and their knowledge on the risk involved.

Strengths and Limitations

Approaching data collection reaching out to different categories of participants as the KII's, FGD participants helped confirm some of the gaps in data from the primary study participants was the main strength of this study.

Participants were members of Nomiya church only and results cannot be generalized to other churches or counties, hence future research may want to explore the religious practices that affect utilization of maternal health services in other churches and counties.

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References

1. UNICEF and World Health Organization. World health statistics 2018.
2. Maternal mortality – our world in data 2018

3. World Health Organization, UNICEF, United Nations Population Fund and the World Bank, Trends in Maternal Mortality: 2000 to 2017 WHO, Geneva, 2019.
4. Ayele DS, Bekele B, Kedir T et al. Factors Affecting Utilization of Maternal Health Care Services in Kombolcha District, Eastern Hararghe Zone, Oromia Regional State, Eastern Ethiopia, 2014. doi.org/10.1155/2014/917058.
5. Ajiboye OE. Socio-Cultural Factors Affecting Pregnancy Outcome Among the Ogu Speaking People of Badagry Area of Lagos State, Nigeria, *International Journal of Humanities & Social Science*, 2012; 2, 133.
6. Yarney L. Knowledge on socio-cultural factors associated with maternal mortality affecting maternal health decisions. A cross-sectional study of the Greater Accra region of Ghana. *BMC Pregnancy Childbirth* 2019. https://doi.org/10.1186/s12884-019-2197-7
7. Gumo S, Samuel OS, Crispinous I. A Theological Perspective on the Socio-historical Grounds for Gender Disparity in the Nomiya Church, 2015. DOI: 10.13189/sa.2015.030804.
8. Azuh D, Oluyemi F, Adiana YA. Socio-cultural factors of gender roles in womens healthcare utilization in Southwest Nigeria. *Open Journal of Social Sciences*, 2015; 3, 105-117, http://dx.doi.org/10.4236/jss.2015.34013
9. Dr. Maguranyanga B. Apostolic religion, health and utilization of maternal and child health service in Zimbabwe., Easter Hararghe zone, Romia regional state, Eastern Ethiopia, 2011.
10. Omondi E. Factors influencing choice of delivery place among mothers in Siaya, BSc. Project, Jomo Kenyatta University

- of Agriculture and Technology, Kenya, 2013.
11. Rashidi A, Rajaram S. Culture care conflicts among Asian-Islamic immigrant women in US hospitals, 2001; 16 (1):55-64, DOI:10.1097/00004650-200110000-00010
 12. Ebere ZO. A Review of the Barriers and Socio-Cultural Factors Influencing the Access to Maternal Health Care Services in Nigeria, 2013.
 13. Kumar A, Taunk A. To Study Reproductive Health Rights Affected by Socio-Cultural Factors in Tarikhet Block District Almora, Uttarakhand, *International Journal of Scientific Footprints*, 2013; 1(1): 26–32.
 14. Atenchong N. Socio-cultural factors associated with maternal mortality in Cameroon, 2016.
 15. Gyimah SO. Denominational Differences in Child Mortality in sub-Saharan Africa: The example of Ghana, 2006.
 16. Nehsuh CA. Maternal mortality in Cameroon: An urgent need for action. Women Deliver Young Leader on Maternal and Newborn Health, 2016.
 17. Mutura RB. Transformation of Christianity in Kenya: A historical survey. *The International Journal of Humanities & Social Studies* 2017; V5 Issue 11 ISSN 2321 – 9203.
 18. Ndambu K. On the trail of Kavonokya sect that has defied modern medicine, 2018.
 19. Olungah CO. The socio-cultural context of maternal healthcare in Bondo district, western Kenya: implications for safe Motherhood interventions, 2006
 20. Sudhe SO, Gumo S, Itoyo C. A Theological Perspective on the Socio-historical Grounds for Gender Disparity in the Nomiya Church, 2015. DOI: 10.13189/sa.2015.030804
 21. Keats EC, Ngugi A, Macharia W, et al., Progress and priorities for reproductive, maternal, newborn, and child health in Kenya: A Countdown to 2015 country case study, 2017. DOI: 10.1016/S2214-109X(17)30246-2
 22. Kenya National Bureau of Statistics, Kenya Demographic Health Survey, 2014.
 23. Gitobu CM, Gichangi PB, Mwanda WO. The effect of Kenya's free maternal health care policy on the utilization of health facility delivery services and maternal and neonatal mortality in public health facilities, *BMC Pregnancy and Childbirth*. 2018; 18:77 <https://doi.org/10.1186/s12884-018-1708-2>
 24. Multiple Indicator Cluster Survey (MICS), 2011.
 25. UNICEF and WHO. Countdown to 2015: A Decade of Tracking Progress for Maternal, Newborn and Child Survival; The 2015 Report, 2015.
 26. Global Health Initiatives Kenya strategy 2011-2014.
 27. Braun V, Clarke V. Using thematic analysis in psychology. *Qualitative Research in Psychology*; 2006; 3, 77–101.

Ethical Considerations

Ethical approval to conduct this study was obtained from the National Commission for Science, Technology and Innovation (NACOSTI) of the Government of Kenya, **License No: NACOSTI/P/19/593**; and Maseno University Ethical and Review Committee, Kenya, **Proposal Reference No: MSU/DRPI/MUERC/00634/18**. The researcher(s) also sought permission from the local administrative, religious and health authorities to conduct this study. All participants gave their informed consent before participating in the study, and were also assured of respecting their anonymity,

privacy and confidentiality. Written or oral consent was acceptable and approved by the relevant ethics committees.

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ABBREVIATIONS

ANC: Ante-Natal Care;

CHV: Community Health Volunteer(S);

FGD: Focused Group Discussion;

HCW: Health Care Worker;

HIV: Human Immunodeficiency Virus;

IDI: In-Depth Interview;

KII: Key Informant Interview;

KII _B: Key Informant Interview – Bishop;

MH: Maternal Health;

KDHS: Kenya Demographic Health Survey;

MDG: Millennium Development Goals;

MMR: Maternal Mortality Ratio;

NCM: Nomiya Church Member;

STI: Sexually Transmitted Infections;

WHO: World Health Organization;

UNICEF: United Nation Children’s Fund

KII_C: Key Informant Interview Clinical Officer;

KII_CH: Key Informant Interview County health coordinator;

KII_SCH: Key Informant Interview, Sub-County health Coordinator;

Researcher’s Background:

The Principal investigator (PI) is an MPH student, specializing in Epidemiology and Population Health. He has a Diploma in

Clinical Medicine and Community health and holds a BSc. Public Health. He has been involved in responding to various public health situations and emergencies. During the many years working as a PHC provider, he found out that Socio-cultural factors, and most especially ‘**religious factors**’ greatly influence health matters such as choice of delivery place, abdominal conditions, cholera, and breast cancers situations among other issues. But little of the socio-cultural information is known or has been developed for public health decision making.

As a clinician, with Protestant Christian virtues and values, ‘being religious’ does not affect my clinical judgment and service delivery to anyone from any faith. This triggered my desire to understand how religious factors affect maternal health. During this study, however I decided to be very accommodative, listened to the participants views, I did not interrupt them while they were talking. I was nice to them and they were also very nice to me. They opened up their doors and thoughts to me and this way I could get a lot of data that was very useful for this study.

Author’s Contributions:

Evans O. Dzenis¹ conceived, designed the research study, coordinated field work, analyzed the data, drafted this manuscript.

Dr. Charles Olan’go supervised and contributed to the study being instrumental in data analysis and designing the reports, critical appraisal of the many drafts from conception of the study to the delivery of the report.

Dr. Louisa Ndunyu supervised and contributed to the study being instrumental in objectivizing the literature search and assuring the methodology is suitable for the study.

All authors have read and approved the final manuscript.

Replacement of Fish Meal with Termite (*Coptotermes formosanus* Shiraki) Meal in the Diets of *Oreochromis niloticus* L Fry Cultured in Aquarium Tanks

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ABSTRACT

This study evaluated the effect of replacing fish meal (FM) with termite meal (TM) on growth performance and nutrient utilization of Nile tilapia fry cultured in aquarium tanks. 100 fish fry (Initial mean weight of 0.1 ± 0.0 g) were randomly stocked in 15 aquarium tanks and fed *ad libitum* at 10 % body weight for 112 days. The TM replaced 0 %, 25 %, 50 %, 75 %, and 100 % (diets C, D₁, D₂, D₃, and D₄, respectively) of FM in an isonitrogenous and isocaloric diet of 40 % Crude protein (CP). D₂ was the most superior diet in terms of mean weight gain, Specific Growth Rate (3.98), Food Conversion Ratio (1.28), Protein Efficiency Ratio (0.79) and survival rate (94.30). The optimum FM replacement level of 50% as predicted by the equation $y = 1.16 + 1.47x - 0.26x^2$ yielded an optimum weight of 3.30 g in eight weeks. The length-weight relationship portrayed an isometric fish growth ($r > 0.9$) in all tanks. This study suggests that 50 % inclusion level of TM can be used to replace FM.

Key words: Termite meal, Fish meal, Nile tilapia, Growth performance, Nutrient utilization

INTRODUCTION

Aquaculture is among the fastest growing food production sectors in the world with an annual growth rate of 8.8 % (FAO, 2018) compared to 1.2 % and 2.8 % for capture fisheries and terrestrial animal production sectors, respectively. Moreover, capture fishery sector, which is the main source of fish meal used in aquafeed industries, has consistently been declining due to ecological degradation; overexploitation and increasing climate change (Smith *et al.*, 2011). As a result of this, attention has shifted to aquaculture sector, which has shown great potential in bridging the fish supply gap caused by the growing human population and demand for white meat (Adi, 2019). There is evidence linking aquaculture to improved livelihood and increased socio-economic growth for smallholder populations through value chain linkages (Munguti *et al.*, 2014; Ogello and

Munguti, 2014). Today, some entrepreneurs are importing frozen tilapia from China to Kenya to fill the gap of fish demand but still the demand of fish has not been accomplished and this has created artificial poverty, and vulnerability to diseases amongst the human population (Obiero *et al.*, 2019). In 2009-2012, the Kenyan government initiated national fish farming program under the Economic Stimulus Program (ESP) which attracted huge public interest in fish farming resulting in increased national fish production from 4,000 MT to 24,096 MT in 2014 (Nyonje *et al.*, 2018). However, the massive interest in aquaculture created fish seed and feed shortage of about 28 million fingerlings and 100,000 tons, respectively (Munguti *et al.*, 2014) which has persisted up to date (Munguti *et al.*, 2021).

Fish feeds account for the highest cost of production compared to other operational

inputs in aquaculture with protein source being the most expensive ingredient (Munguti *et al.* 2012). Fish meal is the common source of animal protein used by most aquafeed industries due to its high nutritional profile and this has contributed to its decline in supply (Tacon and Metian, 2008). However, with the scarcity of fish in natural waters becoming more eminent, other protein sources have attracted scientific interests. Different studies have shown success in partially replacing FM with other protein sources i.e., plant-based, insects, and animal byproducts (Liti *et al.*, 2006; Henry *et al.*, 2015; Ogello *et al.*, 2016).

Different plant protein derivatives such as soybean meal, cotton seed cake, sunflower have been used for fish feed production with mixed levels of success. Some of these materials, especially cereals contain high fibre and anti-nutritional factors that limits their use in fish feed formulation (George *et al.* 2001; Liti *et al.*, 2006; Richie and William, 2011; Ogello *et al.* 2016). On the other hand, animal protein sources such as meat and bone meal, poultry by-product, blood meal, hydrolyzed feather meal have also been used (Hatlen *et al.*, 2014; Psoufakis *et al.*, 2020). However, utilization of some of these ingredients have received low approval rating due to socio-cultural restrictions and competition from livestock feed and human food industries that make them scarce and their use unsustainable (Ogello *et al.*, 2016).

The use of insect meal in fish diets as protein source is currently being practiced and different insects such as black soldier fly (BSF) and housefly larvae have been considered (Talamuk, 2016; Arong and Eyo, 2017). Despite feeding of insects to fish being widely practiced in Sub-Saharan African communities, scientific literature on culture protocols, harvesting and processing for most common insects is still scarce and unavailable in others. When considering insects for fish feeds, it is also important to consider aspects such as raw material availability besides their nutrient composition. According to Ntukuyoh *et al.*, (2012), termites are rich in protein (25-55%) and are widely used as feed for poultry,

fish and for human consumption (Diawara, 2013; Serrano and Poku, 2014; Henry *et al.*, 2015). Termites are collected from the ground by trapping those using substrates that contain cellulose such as grass. Although various species of termites such as *Nasutitermes* spp and *Macrotermes* spp. have been used as fish feeds, *Coptotermes formosanus* has not been used as fish feed. Besides, termites have not been explored as feed for Nile tilapia. Therefore, this study aimed at evaluating the potential of termite (*Coptotermes formosanus* Shiraki) meal, as a replacement of fishmeal in diets for Nile tilapia (*Oreochromis niloticus* Linnaeus) fry.

MATERIALS AND METHODS

Study site

The study was conducted at Kenya Marine and Fisheries Research Institute (KMFRI), Sangoro Station, situated along the shores of Lake Victoria within latitude 0°21' and 12.81' E, and longitude 34°48' and 26.53' S. The fish culture experiment was conducted under green house facility while culture of termites was done in an open field.

Termite culture

Culturing of termites was done using combination of different substrates (dry grass, dry cow dung, dry maize Stover, dry banana leaves, and soil) that are locally available and pot as a cover material. The materials were placed in layers inside a pot with soil spread at the end of each layer and water sprinkled at the end of each layer to provide moisture. Thereafter, the materials were left loose in an inverted pot for a period of ten days undisturbed. After the tenth day, the pots were averted and the presence of the termites was checked, collected and separated from the waste materials. Then, the harvested termites were washed in warm water of about 43.3°C to reduce the fat content and to kill them prior to sun-drying for five days. The dried termites were milled and stored in a refrigerator waiting for its use as recommended by Sogbesan and Ugwumba (2008).

Experimental fish and design

Oreochromis niloticus brooders were obtained from Victoria fish farm and stocked in

bloodstock pond where they were fed intensively for fry production through the natural spawning. Eggs were removed from the female brooders and incubated for 7 days for hatching period until they absorbed the yolk. The fry were fed with 17- α -methyl testosterone treated diet thrice (60mg kg-1 feed) at the rate of 10% body weight per day for 28 days to produce monosex male fry. The hormone treated diet was prepared by the alcohol evaporation technique (Shelton *et al.*, 1978). The fry with initial body weight of 0.10 grams were stocked in five 50 litre aquaria tanks with each holding 100 fry. The fish were acclimatized to the experimental conditions for 14 days before starting the experiment during which the fry were fed on commercial starter feed of 40 % CP at 10 % body weight. The daily ration was divided into two equal ratios and offered twice on a daily basis (0900 and 1500 hours). The experimental period lasted for 112 days. Fish were weighed after every two weeks using a sensitive weighing balance (0.01 g) for the weights and meter board for the lengths. The records were used to compute and adjust feeding rates.

Experimental diets

Feed ingredients were obtained from the KMFRI fish feed processing plant. The feed ingredients used were termite meal, soya bean, fishmeal, cassava, wheat pollard, maize bran, sunflower seed cake, vitamin premix, mineral premix. Five experimental diets with varying inclusion levels of termite meal were formulated as follows: control (C) diet containing 0 % TM, D₁ (25 % TM), D₂ (50 % TM), D₃ (75 % TM) and D₄ (100 % TM). The diets were processed by blending the dry mashed ingredients into a homogenous mixture to form a starter mash of 40 % CP. The proximate compositions of the FM and TM have been summarized in Table 1.

Water quality

Water quality parameters such as temperature (°C), dissolved oxygen (DO, mg/L), pH, were monitored and recorded twice a week using YSI multi-parameter probe immersed at 10cm under the water surface within the aquaria tanks. Total ammonia nitrogen (TAN), free ammonia (NH₃-N) and total nitrogen (TN)

were analyzed weekly using the indophenol blue photometric determination for ammonia and distillation titrimetric method for the nitrates after which calculations were done from the results of the procedure to get the concentrations of nitrites.

Sampling

The data used in this study was based on length and weight data of *O. niloticus* fingerlings reared in the aquaria. Sampling was done biweekly in the aquaria tanks by randomly taking a representative sample of 40 fish from each tank. The fish were sampled for individual total body weight to the nearest 0.1g and total length to the nearest 0.1 cm using an electronic weighing balance and a measuring board respectively

Analytical methods

The termite meal and the fish meal diets were analyzed for proximate composition according to the method of AOAC, (2002). Analyses of the samples were made on a dry matter basis after sun drying the samples for 24 hours.

Growth performance indices

Weight gain (WG), specific growth rate (SGR), survival rate, feed conversion ratio (FCR) protein efficiency ratio (PER) and condition factor (K) were calculated using the following equations:

- i. Mean Weight Gain (MWG) = $\frac{\text{Final mean weight (W}_1\text{)} - \text{initial mean weight (W}_0\text{)}}{\text{time in days}} \times 100$
- ii. Specific Growth Rate (SGR) = $\frac{[\ln(\text{final mean weight}) - \ln(\text{initial mean weight})]}{\text{time in days}} \times 100$
- iii. Survival Rate (%) = $\frac{\text{Number of fish at the end of the experiment}}{\text{Number of fish at the beginning of the experiment}} \times 100$
- iv. Feed Conversion Ratio (FCR) = $\frac{\text{Average feed intake (g)}}{\text{Mean weight gain (g)}}$
- v. Protein Efficiency Ratio (PER) = $\frac{\text{Wet weight gain (g)}}{\text{Dry weight of protein fed (consumed) (g)}}$

- vi. Condition Factor (K) = $\frac{W}{L^3}$; Where W
 = the total weight of fish (g) and L
 = the total length of fish (cm).

Statistical Analysis

Statistical analysis was performed using R statistical software (version 3.2.1). The Bartlett test of homogeneity of variances was used to test for the normality of the data. The effects of experimental diets on growth, survival, FCR, and PER were analyzed with one-way analysis of variance (ANOVA) using Completely Randomized Design (CRD). When significant differences were detected, a Post-Hoc Tukey's HSD test was used to locate the differences. The optimal substitution level of termite meal was determined by polynomial regression plots. Data was presented using graphs in SPSS version 20. Values were expressed as mean \pm standard error of the mean, and the significant differences was accepted at $P < 0.05$.

RESULTS

The growth performance and nutrient utilization

The growth performance and nutrient utilization parameters are summarized in Table 3. There was significantly higher fish growth rate recorded in diets D₁ (25%), and D₂ (50%), but growth response declined as termite protein inclusion exceeded 50 %. The D₂ was more superior diet in terms of final mean weight, weight gain, and SGR followed by D₁, D₃ (75%), Control and D₄ (100%). There was no significant difference in growth parameters between Control and D₄ diets ($P > 0.05$). All growth parameters were lower in the diet D₄ compared to the other diets. Diet 2 recorded the highest survival rate followed by D₁, D₃, Control and D₄. There was no significant difference ($P > 0.05$) in survival rate between diets D₁ and D₂; and between diet Control and D₄. Both Diet D₁ and D₂ had the highest condition factor while D₃, D₄, and Control recorded the lowest condition factor though there was strong positive correlation between length and weight of the fish in all the diets with r close to +1 ($P < 0.05$).

Diet 2 recorded the lowest FCR compared to other diets though not significantly different

from FCR recorded in D₁. There was no significant difference in FCR between diets Control and D₃; and between diets Control and D₄. D₂ recorded significantly higher PER followed by diets D₁, D₃, Control and D₄. The growth curves for *O. niloticus* under different experimental diets are shown in Figure 2. There were no significant differences in growth curves among the diets for the first 36 days ($P > 0.05$). From 84th day onwards, D₂ recorded significantly higher growth rate than the D₃, Control and D₄ diets ($P < 0.05$). The control diet was only significantly different from D₄ on 84th day. However, there was no significant difference between C and D₄ from 98th to the end of the culture period.

Water quality

The results for water-quality parameters are summarized in Table 4. There were no significant differences in temperature, pH, dissolved oxygen, nitrite and ammonia among the treatments ($P > 0.05$). The water temperature ranged from 25.2 to 29.6, dissolved oxygen concentrations 4.74 to 8.12, pH 6.90 to 8.61, nitrite 0.01 to 0.03 and unionized ammonia 0.02 to 0.37 mg.L⁻¹.

Regression analysis

The polynomial regression growth plot is shown in Figure 3, the optimal fish growth weight of about 3.30 g was obtained with D50% after a period of eight weeks. The fish weight declined as the fish meal replacement exceeded D50%. The optimal weight was predicted by the equation $y = 1.16 + 1.47x - 0.26x^2$, where x represents FM substitution level.

DISCUSSION

Results from proximate analysis and feeding trials in this study demonstrate that the nutritional quality of the TM is efficient in promoting better growth of *O. niloticus*. The crude protein (CP) content of the TM in the present study was (45.8 %). The CP content of the termite used in the present study was relatively higher than the CP of termites in the previous studies reported by Phelps *et al.* (1975), Aduku, (1993) and Oyarzun *et al.* (1996), on *Nasutitermes* spp. (44.12 %), *Macrotermes* spp (37 %), *Macrotermes falciger alates* (41.80 %), respectively. However, the

results of the CP content of termite in the present study was slightly lower than the CP content of termites in the previous studies as reported by Fadiyimu *et al.* (2003), Tiroesele and Moreki (2012), Ntukuyoh *et al.* (2012), Serrano and Poku, (2014) on *Macrotermes* spp (48.80 %), *Macrotermes* spp (46.30 %), *Nasutitermes* spp (55.10 %), *Macrotermes bellicosus* (54.69 %), respectively. The differences observed above in the CP levels could be due to the different processing methods. In the present study, the termites were sun dried however in the previous studies; the termites were oven-dried. This is in agreement with the previous studies done on the effect of sun drying and oven drying on the nutritional properties on meat, chicken where sun dried food recorded the highest CP as compared to oven-dried food, (Ayanwale, 2007).

Lipids were higher in the TM (20.9 %) than in FM (7.6 %) in the present study. This is in agreement with previous studies that indicated termite meal contains very high lipid levels (Aduku 1993; Oyarzun *et al.*, 1996; Sogbesan and Ugwumba 2008; Tiroesele and Moreki 2012; Serrano and Poku 2014 and Oliniyi *et al.*, 2016). The ash content of the termite meal (8.2 %) in the present study was approximately three times lower than the ash content of the fish meal (25.2 %) indicating that the termite meal was poor in mineral composition. These results confirm the finding of Barker *et al.* (1998) ; Serrano and Poku (2014) and Oliniyi *et al.* (2016), that insects contain low levels of major mineral compositions especially phosphorus and calcium.

In the present study, all the diets displayed exponential growth curves. This is an indication that the diets were sufficient and readily met the nutritional requirement of the experimental fish. In addition, the growth response of *O. niloticus* observed in the current study presumably reflects its high adaptability to a wide range of feeding regime (Kevin, 2000). Similar growth curves were observed in the previous studies done by Sogbesan *et al.*, 2008

The D₂ (50 % TM) was superior to all other

diets in terms of final mean weight, weight gain, SGR, and survival rate (Table 3). This agrees with the study done by Sogbesan and Ugwumba, (2008) that at 50 % inclusion of TM, fish displays an increased growth but the growth rate reduces as the inclusion level increases above 50 %. The 50 % TM inclusion level was also lower but close to 40 % replacement level suggested by Oliniyi *et al.* (2016) in the culture of African catfish. The increased growth by D₂ may be attributed to the ability of fish to use the proteins available in the feeds efficiently as well as the available crude lipids in the diet. The high dietary lipid in TM also increased the growth rate of fish as explained by Lee and Sang, (2005) that increased crude lipid can improve growth of fish as well as protein utilization. The poor growth rates with inclusion level higher than 50 % was due the presence of high levels of fibre (10.5 %). The high crude fibre could be due to the termite exoskeleton that contains high chitin levels which is a complex carbohydrate which can be poorly digested by the *O. niloticus* fry. These results corroborate with the findings of Serrano and Poku (2014) who observed lower growth rates of freshwater prawn with high inclusion levels of termite meal. This indicates that 50 % TM inclusion level can promote the growth performance despite the high nutritional profile of FM.

Termite has been appraised in rearing other animal species such as chicken and has been considered to be very palatable and suitable replacement for fish meal (Men *et al.* 2005). The current study revealed that FCR and PER was high in the D₂ diets. This is an indication that the D₂ diet had good quality and palatability of protein. De Silver and Anderson (1995) explained that PER is the measure of how well protein sources can provide various essential amino acids required by fish fed. Also, PER has been associated with fat deposition in the muscles of fish and higher PER indicates the diet that produces fatty fish. This is illustrated in D₂ which recorded the highest PER meaning that the fish utilized the proteins available in the feed efficiently while D₄ and C recorded the lowest

PER an indication that the protein was not efficiently used hence the lower growth rate. The present results are similar to those done by Sogbesan and Ugwumba, (2008) where higher PER of 35.76 % was recorded in 50 % termite meal diet and lowest value of 23.07 % in 100 % termite meal diet. The lower growth rate recorded at 100 % termite inclusion level could be attributed to high fibre content in the termite meal. This is because high fibre and ash content in the diets reduces the digestibility and palatability of the feed (Abowei and Ekubo, (2011). This is in agreement with the studies done by Serrano and Poku, (2014), and Sogbesan and Ugwumba, (2008) where low growth rates were recorded with inclusion level of termite meal higher than 50 % due to high fibre content.

Feed conversion ratio (FCR) is one of the important indicators of the quality of fish feed as the lower the FCR the better the utilization of the fish feed (Mugo *et al.*,2013). The low FCR of 1.28 ± 0.03 exhibited in fish fed D₂ is an indication that the fish utilized the feed given well. FCR recorded in the current study is slightly lower than the values obtained in the culture of *Macrobranchium rosenbergii* and *Heterobranchus longifilis* (2.29 % to 3.89 %) fed on TM. These differences may be due to different species of termite as well different rearing facility. It is reported from previous studies that *O. niloticus* cultured in tanks can have very efficient feed conversion ratios in the range of 1.4 to 1.8 (DeLong *et al.*, 2009) and this is justified in the present study where the FCR of 1.28 to 2.15 was recorded.

In fish, the condition factor (K) generally illustrates the condition of the fish as it reflects the physical and biological conditions through the interaction of the different feeding conditions (Kembenya and Munguti, 2014). Fish can impose allometric or isometric growth depending on the condition. Isometric growth can be achieved when appropriate conditions are available meaning that the relationship between the weight and length of fish will be positive (Kembenya and Munguti, 2014). In this present study, all the treatment

diets recorded a condition factor above 1.0 as recommended by Wade (1992). This is an indication that the feeds were utilized properly for better performance of fish. This is also reflected in the previous studies on use of TM where the condition factors were above 1.0. The results corroborate with the previous studies of Serrano and Poku, (2014) and Sogbesan and Ugwumba, (2008).

Water quality is one of the most critical factors in culturing of fish and has direct impact on feed efficiency, growth rate, fish survival as well as general health of the cultured fish (DeLong *et al.*, 2009). Therefore, for fish to survive within the desired limits, the fluctuations within the ranges should be gradual since a rapid change in the water quality will have serious impact on the fish in terms of stress, reduced disease resistance and death to fish (Boyd, 1998). Results of water quality parameters in the present study were at the optimal range as the requirement of *O. niloticus* thus did not significantly affect the growth performance of the fish.

Conclusion and recommendation

The results obtained from the present study indicates that 50% inclusion level had the best performance in terms of final mean weight, weight gain, specific growth rate, survival rate, feed conversion ratio, protein efficiency ratio and condition factor. This shows that termite meal will be the best to replace fishmeal at 50% in *O. niloticus* fry diet for better growth and to maximize profits. The present study therefore suggests that, as FM protein sources become scarce and more expensive, farmers should include 50% inclusion level of TM to replace FM in *O. niloticus* diets. In addition, less expensive methods of removal of exoskeleton should be made available in order to improve the nutritional profile of the termites so that fishmeal can be replaced the termite diet even at 100% without compromising the growth performance of the fed fish.

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REFERENCES

- Abdel-Hakim N. F., Hussein M.S., Bakeer M. N., & Soltan M. A., 2001. Effect of protein level and stocking density on growth performance of Nile tilapia (*Oreochromis niloticus*) cultured in tanks. *Egypt J. Nutr. Feeds* 4, 763-780.
- Abowei J. F. N., & Ekubo A.T., 2011. Review of conventional and unconventional feeds in fish nutrition. *Br. J. toxicol* 2(4):179-191.
- Adepoju, O.T., & Omotayo, O.A., 2014. 'Nutrient Composition and Potential Contribution of Winged Termites (*Macrotermes bellicosus* Smeathman) to Micronutrient Intake of Consumers in Nigeria' *British Journal of Applied Science & Technology*, 4(7):1149-1154.
- Adi J. P., 2019. Aquaculture role in global food security with nutritional value: a review, *Transitional Animal Science*, 3(2): 903-910
- Albert G.J., & Marc Metian, 2008. Global overview on the use of fish meal and fish oil in industrially compounded aquafeeds: Trends and future prospects. *Aquaculture* 285: 146–158.
- AOAC, 2002. Association of Official Analytical Chemists. Official methods of analysis (17th edition), Official Method 934.01, 942.05, 4.2.07, 920.39. Arlington, Virginia, USA.
- Arong, G. A., & Eyo.V. O., 2017. Evaluation of house fly (*Musca domestica*) maggot meal and termite (*Macrotermes subhyalinus*) meal as supplementary feed for African catfish *Clarias gariepinus* (Burchell, 1822). *IJEN*, Vol. 3(1), pp. 042-050.
- Ayanwale. B. A., Ocheme. O. B., & Oloyede. O. O., 2007. The effect of sun-drying and oven-drying on the nutritive value of meat pieces on hot humid environment. *Pakistan Journal of Nutrition* 6(4): 370-374.
- Boyd, C.E., & Tucker, C.S., 1998. *Pond Aquaculture Water Quality Management*. Kluwer Academic Publishers, Boston, MA, USA.
- Bulbul, M., Koshio, S., Ishikawa, M., Yokoyama, S., & Kader, M. A., 2013. Performance of kuruma shrimp, *Marsupenaeus japonicus* fed diets replacing fishmeal with a combination of plant protein meals. *Aquaculture*, 372, 4551.
- De Silva S. S., & Anderson T. A., 1995. *Fish Nutrition in Aquaculture*. Chapman and Hall Aquaculture Series U.K., pp 319.
- DeLong D. P., Losordo T. M., & Rakocy J. E., 2009. Tank culture of tilapia. Southern Regional Aquaculture Center.
- Dewalle D. R., Swistock B. R., & Sharpe W. E., 2017. Episodic flow – duration analysis: assessing toxic exposure of brook trout (*Salvenius fontinalis*) to episodic increases in aluminium.
- Diawara, M., 2013. Impact the l'Utilisation des Termites en Aviculture Traditionelle au Burkina Faso. - Mémoire de Fin de Cycle. Université Polytechnique de Bobo-Dioulasso, Burkina Faso.
- Erick O. O., Elijah M. K., Cecilia M. G., Callen N. A., Munguti J. M., & Chrispine S. N., 2017. Substitution of fishmeal with sunflower seed meal in diets for Nile tilapia (*Oreochromis niloticus* L) reared I earthen ponds. *Journal of Applied Aquaculture*.

- Fadiyimu, A. A., Ayodele, A. O., Olowu, P. A., & Folorunso, O. R., 2003. Performance of finishing broilers fed graded levels of termite meal as replacement for fish meal. Proceeding of the 28th Annual Conference of Nigeran society for Animal Production, 28: 211 -212.
- FAO., 2017. Social and Economic Performance of Tilapia Farming in Africa. Pp 95.
- Hatlen .N., Jackobsen V., Crampton V., Langmyhr E., Espe M., Hevroy E.M., Torstensen B.E., Liland N., & Waagbo R., 2014. Growth, feed utilization and endocrine responses in Atlantic salmon (*Salmo salar*) fed diets added poultry by-product meal and bloodmeal in combination with poultry oil. *aquaculture nutrition*, 21,(5).
- Henry, M., Gasco, L., Piccolo, G. & Fountoulaki, E., 2015. Review on the use of insects in the diet of farmed fish: Past and future. *Anim. Feed. Sci.Tech*, 203: 1–22.
- Kembenya E., & Munguti J., 2014. The Length-Weight Relationship and Condition Factor of Nile Tilapia (*Oreochromis niloticus* L) Broodstock at Kegati Aquaculture Reseachr Station, Kisii, Kenya. *International Journal of Advanced Research*. 2.777-782.
- Lee O. K & Sang-Min L., 2005. Effects of dietary protein and lipid levels on growth and body composition of bagrid catfish, (*Pseudobagrus fulvidraco*). *Aquaculture*, 243 (1.4), 323-329.
- Liti, D. M., Waidbacher, H., Straif M., Mbaluka R. K., Munguti J. M., & Kyenze M. M., 2006. Effects of partial and complete replacement of freshwater shrimp meal (*Caridina nilotica* Roux) with a mixture of plant protein sources on growth performance of Nile tilapia (*Oreochromis niloticus* L.) in fertilized ponds. *Aquaculture Research* 36:746–752.
- Mohantry R. K., 2004. Density-dependent growth performance of Indian major carps in rain water reservoirs. *J Appll Ichthyo* 20(2):123-127.
- Mugo-Bundi J., Oyoo O. E., Ngugi C. C., Manguya-Lusenga D., Rasowo J., & Chepkirui-Boit V., 2003. Utilization of *Caridina nilotica* (Roux) meal as a protein ingredient in feeds for Nile Tilapia (*Oreochromis niloticus*). *Aquacult Res*, 1-12.
- Munguti J. M., Safina Musa, Paul S. Orina, Domitila N Kyule, Mary A. Opiyo, Harrison Charo-Karisa and Erick Ochieng Ogello, 2014. An overview of current status of Kenyan fish feed industry and feed management practices, challenges and opportunities. *International Journal of Fisheries and Aquatic Studies* 1(6): 128-137.
- Munguti, J., Charo-Karisa H., Opiyo M. A., Ogello E. O., Marijani E.,, Nzayisenga L., & Liti D., 2012. Nutritive value and availability of commonly used feed ingredients for farmed Nile tilapia (*Oreochromis niloticus* L.) and African catfish (*Clarias gariepinus*, Burchell) in Kenya, Rwanda and Tanzania. *African Journal of Food Agriculture, Nutrition and Development* 12(3): 1–22.
- Ngugi, C. C., Bowman, J. R., & Omolo, B. O., 2007. A New guide to fish farming in Kenya. Aquaculture Collaborative Research Support Program. Oregon State University (U.S.A), Moi University and Ministry of Livestock and Fisheries Development, Government of Kenya. ISBN 978-0-9798658-0-0.
- Ntukuyoh A.I., Udian D.S., Ikpe E., & Akpakpan A.E., 2012. Evaluation of Nutrutional Value of Termites

- (*Macrotermes bellicosus*) soldiers, workers and queen in the Niger Delta Region of Nigeria. *International Journal of Food Nutrition and Safety*, 1(20):60-65.
- Nyonje B.M., Opiyo M.A., Orina P.S., Abwao J., Wainaina M., & Charo-Karisa H., 2018. Current status of fresh water fish hatcheries, broodstock management and fingerling production in Kenya aquaculture sector. *Livestock research for rural development*. Volume 30, article #6.
- Obiero K., Meulenbroek P., Drexler S., Dagne A., Akoll P., Odong R., Kaunda-Arara B., & Waidbacher H., 2019. The Contribution of Fish to Food and Nutrition Security in Eastern Africa: Emerging Trends and Future Outlooks. *Sustainability*. 11(6):1636.
- Oloniya, C. O., Olabomi, F. T., & Ajayi, O. M., 2016. Performance characteristics and nutrients utilization of African cat fish fed termite-based diets. *International Journal of Science, Environment and Technology*, Vol. 5, No 5, 2679-2688.
- Park, Haeree H., 2016. "Black Soldier Fly Larvae Manual". Student Showcase. 14. Retrieved from https://scholarworks.umass.edu/sustainableumass_studentshowcase/14
- Psoufakis P., Karapanagiotidis I.T., Malandrakis E.E., Golomazou E., Exadactylos A., & Mente E., 2020. Effect of fishmeal replacement by hydrolyzed feather meal on growth performance, proximate composition, digestive enzyme activity, haematological parameters and growth-related gene expression of gilthead seabream (*Sparus aurata*). *Aquaculture*, 10.1016/j.aquaculture.2020.735006.
- Raphael Talamuk, 2016. Comparisons of growth performance of African catfish (*Clarias gariepinus* BURCHELL, 1822) Fingerlings fed different inclusion levels of Black Soldier Fly (*Hermetia illucens*) larva meal diets. Stellenbosch University
- Richie, M & William., 2011. Fishmeal replacement with solvent extracted soybean meal or soy protein isolate in a practical diet formulation for Florida pompano (*Trachinotus carolinus*, L) reared in low salinity. *Aquaculture Nutrition* 17:368-379.
- Serrano A.E, & Poku G, 2014. Nutritive value of termite as fishmeal supplement in the diets of freshwater shrimp (*Macrobrachium rosenbergii* de Man) juveniles. *International Journal of Bioflux Society*.
- Smith, H. G., G. J. Sheridan, P. N. J. Lane, P. Nyman, & S. Haydon., 2011. Wildfire effects on water quality in forest catchments: A review with implications for water supply. *J. Hydrol.* 396: 170–192.
- Sogbesan A. O., & Ugwumba A. A. A., 2008b. Nutritional evaluation of termite (*Macrotermes subhyalinus*) meal as animal protein supplements in the diets of *Heterobranchus longifilis* (Valenciennes, 1840) fingerlings. *Turk J Fish Aquat Sci* 8:149-157.
- Wade J.W., 1992. The relationship between temperature, food intake and growth of brown trout, *Salmo trutta* (L) fed Natural and Artificial pelleted diet in earth ponds. *Journal of Aquatic Sciences*, 7: 59

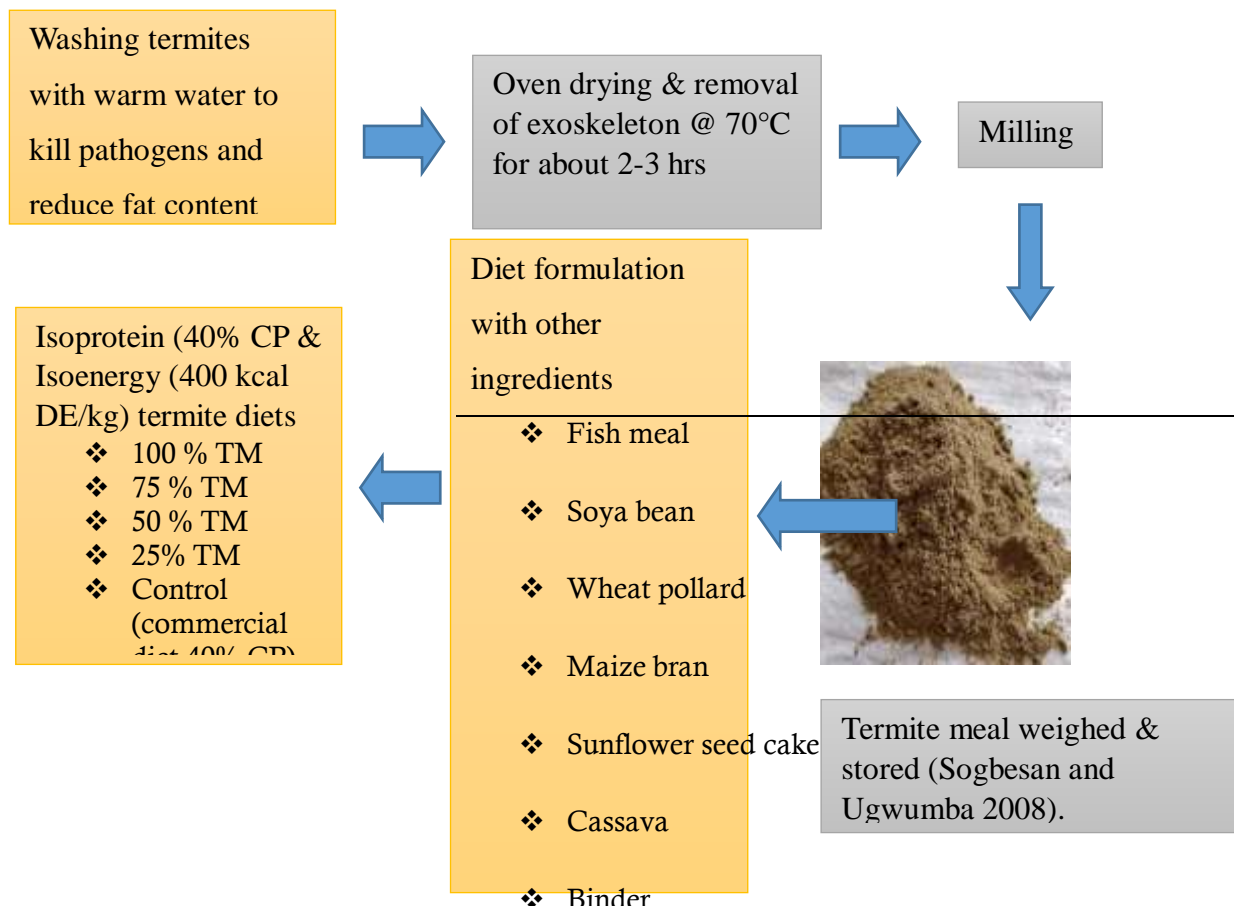


Figure 1. Termite meal processing and diet formulation (Modified from Ogello *et al.*, 2016)

- ❖ Mineral premix
- ❖ Vitamin premix

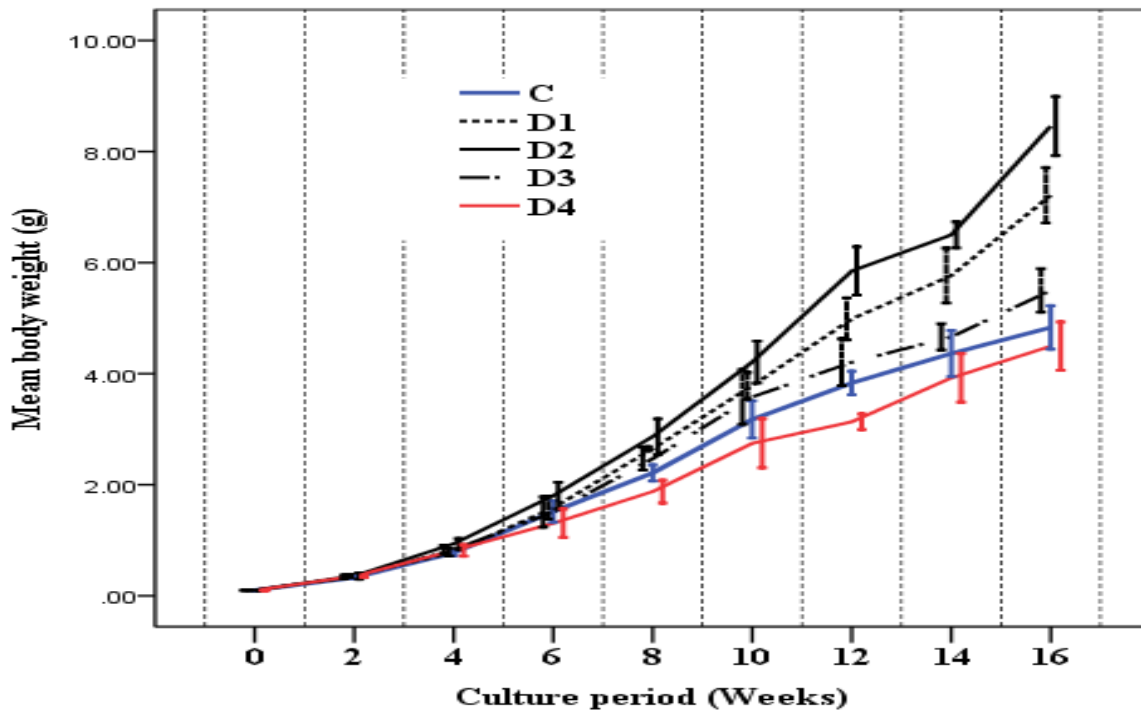


Figure 2. Growth curves for Nile tilapia fed with experimental diets for 112 days. C: control diet, D₁, D₂, D₃, and D₄ represent substitution of FM with 25 %, 50 %, 75 %, and 100 % TM, respectively. Vertical bars denote mean ± standard deviation of three replicates.

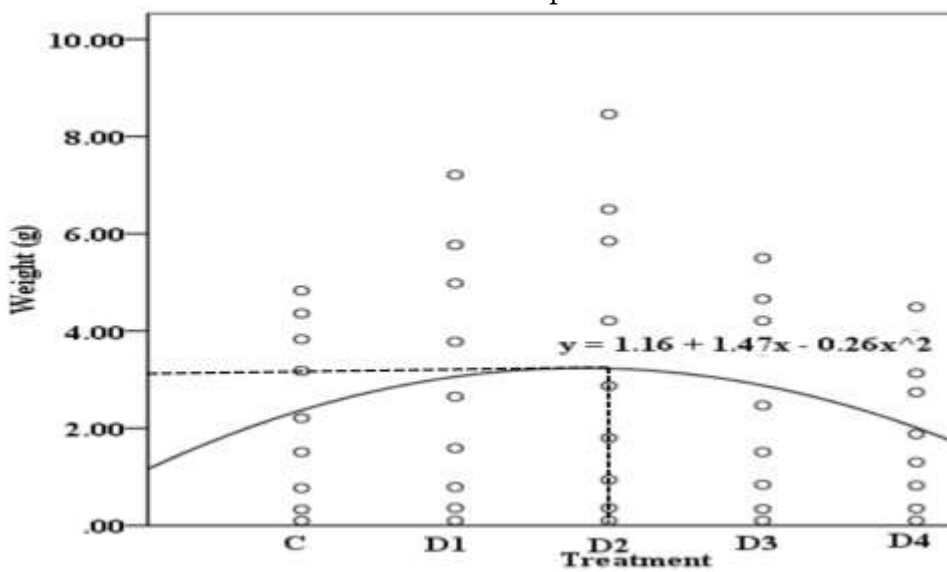


Figure 3. Polynomial regression growth curves for Nile tilapia fed with different concentration of the experimental diets. C: Control diet; D₁, D₂, D₃ and D₄ represent substitution of fishmeal with 25 %, 50 %, 75 % and 100 % termite meal, respectively. Residual standard error: 201.6, Adjusted R²: 0.045, F: 9.985, P < 0.05.

Table 1. Proximate composition of the FM and TM used for feeding Nile tilapia during the 112-day experimental period

Ingredients	Dry matter	Ash	CP	Lipid	Fibre
Fish meal	93.2	25.2	52	7.6	3.1
Termite meal	95.0	8.2	45.8	20.9	10.5

Table 2. Proportion of feed ingredients of experimental diets used for feeding Nile tilapia fry during the experimental period

PARAMETERS	Diets (% termite inclusion levels)				
	C (0 %)	D₁ (25 %)	D₂ (50 %)	D₃ (75 %)	D₄ (100 %)
Termite meal	0	15.35	25.10	34.85	44.60
Fish meal	45.2	29.25	19.5	9.75	0
Soya bean	35	35	35	35	35
Wheat pollard	5	5	5	5	5
Maize bran	5	5	5	5	5
Sunflower seed cake	3	3	3	3	3
Cassava	7	7	7	7	7
Binder	0.2	0.2	0.2	0.2	0.2
Vitamin premix	0.1	0.1	0.1	0.1	0.1
Mineral premix	0.1	0.1	0.1	0.1	0.1
Total	100	100	100	100	100
Crude protein (%)	40.32	40.21	40.45	40.19	40.25

C, D₁, D₂, D₃, D₄ represent substitution of FM with 0 %, 25 %, 50 %, 75 % and 100 % TM, respectively.

Table 3. Fish growth performance and nutrient utilization parameters comparing the experimental diets for experimental period. The values represent means \pm S.E

Variable	C	D ₁	D ₂	D ₃	D ₄
Initial mean weight (g)	0.10 ± 0.00^a	0.10	± 0.10	± 0.10	0.10 ± 0.00^a
Final mean weight (g)	4.83	± 7.21	± 8.46	$\pm 5.50 \pm 0.23^d$	4.50
	23^{ad}		1^c		0.25^a
Weight gain (g)	4.73	± 7.11	± 8.56	$\pm 5.40 \pm 0.07^d$	4.39
	8^{ad}		9^c		0.25^a
Specific growth rate (SGR;)	3.46	± 3.82	± 3.98	$\pm 3.58 \pm 0.01^d$	3.39
Condition factor (K)	1.61 ± 0.08^a	2.93	± 2.76	$\pm 1.70 \pm 0.07^a$	1.66
		6^b	9^b		4^a
Protein Efficiency Ratio	0.52	± 0.71	± 0.79	$\pm 0.58 \pm 0.01^a$	0.47
		0^c	2^d		3^b
Food Conversion Ratio	1.91	± 1.42	± 1.28	$\pm 1.73 \pm 0.02^a$	2.15
		1^c	3^c		2^b
Survival rate (%)	81.98 ± 2.7^a	93.91	± 94.30	$\pm 86.34 \pm 0.7^c$	80.09
		4^b	3^b		9^a

One-way ANOVA, Tukey post-hoc test. Values with different superscripts in the same row are significantly different at $P < 0.05$, $a > b > c > d$. C: control diet; D₁, D₂, D₃, and D₄ represent substitution of FM with 25 %, 50 %, 75 %, and 100 % TM, respectively.

Table 4. The physicochemical water-quality parameters measured in the *O. niloticus* experimental tanks supplied with different diets for 112 days. Values are presented as mean \pm standard error of mean.

Variable	C	D1	D2	D3	D4	Ideal ranges
Temperature ($^{\circ}\text{C}$)	27.2 ± 1.7	27.3 ± 1.8	27.2 ± 2.0	27.3 ± 1.9	27.0 ± 1.9	20 – 35 (Ngugi <i>et al.</i> 2007)
Ph	7.83 ± 0.71	7.50 ± 0.64	7.63 ± 0.74	7.75 ± 0.88	7.85 ± 0.74	5 – 10 (DeWalle <i>et al.</i> , 2011)
Oxygen (mg.L^{-1})	5.71 ± 2.11	5.36 1.27	± 5.98 2.18	± 5.52 2.23	± 5.47 2.39	$\pm 5 - 7.5$ (Boyd, 1998)
Nitrite (mg.L^{-1})	0.02 ± 0.00	0.03 0.01	± 0.02 0.00	± 0.03 0.01	± 0.02 0.00	$\pm < 1.5$ (Boyd, 1998)
Ammonia (mg, L^{-1})	0.27 ± 0.09	0.05 0.03	± 0.08 0.02	± 0.19 0.06	± 0.17 0.02	$\pm < 1.5$ (Boyd, 1998)

One-way ANOVA, Tukey Test, n = 32; C: control diet; D₁, D₂, D₃, and D₄ represent substitution of FM with 25 %, 50 %, 75 %, and 100 % TM, respectively.

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Massart, D. L., & Kauffmann, L. (1983). *Interpretation of analytical data by use of cluster analysis*. New York: Wiley.

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