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Original Research Article

Knowledge, Perception and Practices on Dietary Supplement Use among Adults in Westlands Constituency, Kenya

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Abstract: The study investigated qualitatively and quantitatively the present knowledge, perception and practices towards dietary supplements among 139 adults between the ages of 18-64 who were randomly selected in Westlands Constituency, Kenya. Data collection was conducted using a semi-structured questionnaire during the harvest season (November 2019). Whereby, the data collection was done using Open Data Kit (ODK) and analyses were conducted using Statistical Package for Social Sciences (SPSS0 version 20. The results indicated that this study consisted of largely a youthful population between the ages 18-34 years of age. Only 14.4% (n=20) of the total study population indicated to have used dietary supplements within 12 months from when the study was conducted. Females covered the largest proportions (64.3%) in the entire study compared to the proportions (33.4%) of males (X^2 (2) = 2.383, p=0.304). There was a greater level of use among females between the ages of 18-34 residing in Loresho and Parklands respectively. Whereby, multivitamins were the common and widely dietary supplements by 70% of the supplement users. The main reason why a majority of the females used dietary supplements was largely due to anaemia and Osteomalacia respectively. Contrary, the males who used supplements in this study wanted to alter the structure of the body (muscle hypertrophy) as a result used creatine and whey protein supplements. The proportion (64.3%) of females was significantly higher to the proportions (33.4%) of males who got prescription from a medical practitioner for the supplements used (X^2/Likelihood ratio (1) = 14.004, p=0.009). However, the largest proportion (50%) of females and male proportion (50%) sourced the supplements by purchasing the supplements over the counter from pharmacies. There were so many misconceptions with regards to the definition of dietary supplements since the results indicated that a majority of the adults in Westlands constituency perceived dietary supplements as drugs containing extra nutrients to boost immunity. However, there was no significant difference in the listing of ingredients that make up supplements among the adults within the different education levels (X^2/Likelihood ratio= 30.572, df= 28, p= 0.336). Concerning, the level of knowledge on dietary supplements the results were underwhelming as the largest proportion (53.96%) of the adults were less knowledgeable on dietary supplements as they scored marks in the low threshold of 0-25%. Overall, a low prevalence of dietary supplement use was observed. With the adults in this study having unsatisfactory level of knowledge and confusing perceptions on dietary supplements making them susceptible to spreading misinformation regarding dietary supplements and at risk of micronutrient diseases since a majority of the users were using supplements due to an underlying health condition over personal preference. Therefore, public awareness is imperative on dietary supplement knowledge and the ramifications of micronutrient deficiencies in the life cycle. Thus, health professionals and nutritionists have a vital role in sensitizing the entire population about the importance of proper dietary supplement use and cost effective means of transitioning to healthier eating patterns for better health outcomes.

Keyword: Dietary supplements, multivitamin, single mineral, omega 3 fatty acids, whey protein, creatine, Kenya.

1. INTRODUCTION

One of the most notable effects of the Global Covid-19 pandemic in nutrition has been the increase in the use of dietary supplements among populations for immunity against the virus. Globalization has also presented opportunities for the marketing of dietary supplements. However, we cannot shy away from the present risks and challenges that come with the misuse of dietary supplements due to the lack of proper knowledge (Pinstrup and Barbinard, 2001). The nutraceutical market has grown immensely over the years as a lifestyle industry driven by wellness and

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healthy lifestyle among populations. The word 'Nutraceutical' refers to any component of food that provides medicinal or health benefits (Khandelwal, 2020). The various compounds that are listed as Nutraceuticals range from; specific diets genetically engineered, isolated nutrients and dietary supplements (Golani *et al.*, 2020).

In the African context, South Africa and Nigeria are the leading front runners in the nutraceutical market respectively (Mordor Intelligence Private Limited, 2020a). With other African countries like Kenya catching up to the healthy living, wellness and fitness trends and thus driving the dietary supplements higher.

There are different types of Nutraceuticals available in the market and have been classified according to their application as follows; traditional, non-traditional, dietary supplements, probiotics, fortified, herbals, recombinants, phytochemicals, herbal, functional foods and prebiotics (Molouki *et al.*, 2021). With dietary supplements as diet aids' are amounting to 26% of the nutraceutical market worldwide. North America being the largest consumer of dietary supplements worldwide and the United States (as the largest single country) relatively contributing to 27% of the global sales in the year 2018 (PwC, 2019). The different categories of dietary supplements include multiminerals, multivitamins, vitamins, proteins, minerals, hormone activators, herbs, oil supplements and carbohydrates (Hassan *et al.*, 2020).

From a public health point of view, nutraceutical products are consumed to improve or maintain health (Mordor Intelligence Private Limited, 2020b). In recent studies, the use of such products has been popular for the management of disease. Effective initiatives such as the iron/folic acid supplementation of pregnant women and fortification of staple foods remain as critical strategies to combat micronutrient deficiencies among populations. It is reported that Kenya has a long history of supplementation/food fortification since 1972 when voluntary salt fortification began and then in 1978 there was the enactment of the legislation on mandatory salt iodization. This was followed by the amendment of the Food, Drugs and Chemical Substances Act of the Laws of Kenya which granted the mandatory fortification of vegetable fats and oils, maize flour and wheat flour in the year 2012.

This Law was amended in 2015 to provide the standards/guidelines for the fortification programs. The United States congress established a Law called "Dietary Supplements health and Education Act" which included an exhaustive list of Nutraceuticals in a dietary list for safety evaluations (Molouki *et al.*, 2021). The major concern for most developing countries is that the adoption of specific regulatory guidelines for Nutraceuticals has not been fully adopted and implemented as a result there is a need to prepare regulatory guidelines to control the market from counterfeit and low quality products.

The popularity of food supplements in the nutraceutical market has grown aggressively due to the rigorous advertising in the media, and the common beliefs that these substances do not have side effects which prompts for a need for continuous monitoring of the nutraceutical industry to ensure consumer safety (Molouki *et al.*, 2021).

In Kenya, the practice of dietary supplements usage is believed to improve athletic performance and avoid pathological conditions and that explains why supplement use is mostly common among athletes and gym members (Chepngetich, Too and Bor, 2019). However, even though there have been numerous population studies in relation to dietary supplement use in developed countries, population studies on consumer knowledge are limited in developing countries such as Kenya (Alfawaz *et al.*, 2018).

Previous studies have alluded to the fact that there is a linkage in long term dietary supplement usage and the occurrence of certain lifestyle diseases such as obesity and chronic diseases (Oberländer, Disdier and Etilé, 2017). Therefore, this indicates a need for extensive research to find out the relationship between dietary supplements use and morbidity rate. Recent studies argue that a majority of dietary supplement users, often self-prescribe dietary supplements without consulting medical experts which leads to fatal incidences in some cases due to the use of counterfeit products available in the market. Yet data on dietary supplements users' knowledge and practices is still very limited in Kenya as most of the data available comes from commercial market analysis with a major focus on athletes as opposed to the general population, for marketing purposes rather than consumer health surveys (Sirico, Miressi, Castaldo, Spera, Montagnani, Meglio, *et al.*, 2018). Therefore, the application of research methods is important to find out issues related with long term dietary supplement usage and morbidity status amongst populations.

Therefore, this study sought to determine the intake of nutrients from foods and dietary supplements in order to highlight the potential risk factors that could arise due to the incorrect use of dietary supplements and poor dietary intake among urban adults in Kenya.

2. MATERIALS AND METHODS

2.1 Study Area

The cross-sectional study was conducted among households with adults aged 18-64 years in five wards that include; Kitisuru, Parklands, Karura, Kangemi and Mountain View located within Westlands constituency in Nairobi County (Figure 1).

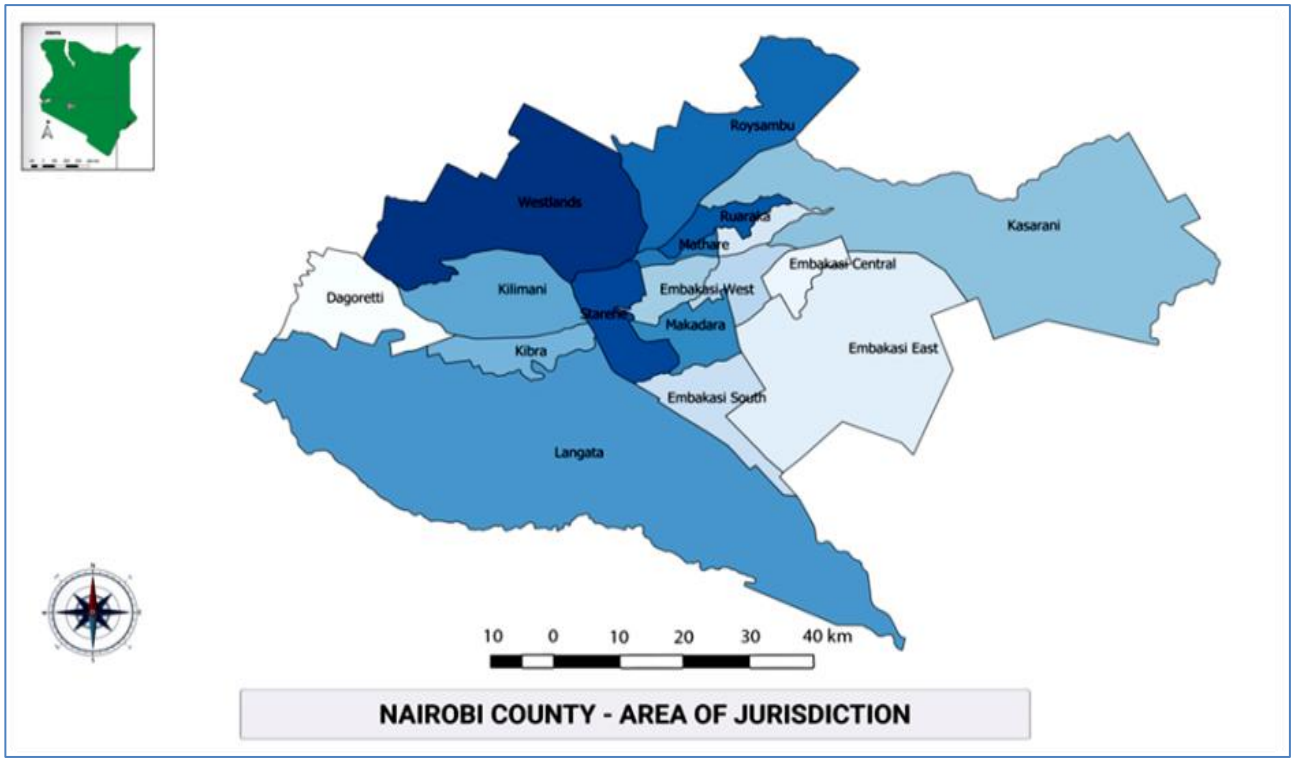

Fig-1: Map of Nairobi County and sub counties
Source: Athi Water Works Development Agency, 2017

2.2 Methods

A semi-structured questionnaire was adopted from Wachira and modified in order to collect detailed qualitative and quantitative data for comparisons on knowledge, perceptions and practices on dietary supplement use among the study participants (Wachira, 2011). There were three open ended questions for determining the perception on dietary supplements (not included in the overall knowledge score).The study population was interviewed a total of eight questions with a true or false response to determine their knowledge of dietary supplements. One point was allocated for correct responses and incorrect responses were allocated a zero. The knowledge scores were further divided into tertiles; low (inadequate knowledge), moderate and high (adequate knowledge). In total, there were 27 questions on the use of dietary supplement (including side effects) for those who used dietary supplements the past 12 months before the study was conducted. A market survey was carried out in Nairobi city in order to classify the different types of dietary supplements used prior to undertaking the research with considerations from the online analytical trends (Euromonitor International, 2019) . The supplements that contained more than one vitamin were classified as multivitamins and those that contained other ingredients were classified according to the recommended use.

The practice of dietary supplement use examined the types of dietary supplements used by the adults over past 12 months; Prescription type and source of the dietary supplements. The comparison was made between the 20 adults who consumed supplements and 119 adults who did not consume any supplements. The data was exported from Open Data Kit (ODK) to SPSS in an excel format. The Statistical Package for Social Sciences (SPSS Inc. version 20) was used for data analysis. Descriptive statistics (frequencies, means, medians, percentages and standard deviations) were used to analyze data. Cross tabulation analysis were carried out to find out the variations in socio demographic and economic characteristics between males and females. Chi square/Likelihood ratio analysis was computed at p=0.05 level of significance for demographic characteristics, perceptions on supplements and the knowledge score, perceptions and dietary supplement practices between the groups. In cells where the counts were less than five, the likelihood ratio test was used. Descriptive statistics (frequencies, means, medians, percentages and standard deviations) were used to analyse data for socio demographic and socio economic variables.

2.3 Ethical considerations

Authorization to conduct the study was obtained from the Deputy County Commissioner Officer in charge of Westlands Sub County. Also, a research permit was acquired from National Commission for Science, Technology and Innovation (NACOSTI). While, informed consent was also obtained from the participants prior to the interviews. The interviews were conducted in private, at places that were of convenience for the respondents.

3. RESULTS

3.1 Socio-demographic characteristics of the adults between the ages 18-64 years in Westlands Constituency, Nairobi County

The study participants consisted of 139 adults from Westlands, Nairobi County. The ages of the adults were in the range of 18-64 years, with a mean of 29±9.07 years (Table 1).

Table-1: Distribution of study participants grouped by gender according to Socio demographic characteristics in Westlands constituency, Nairobi County

Characteristic	N	Sex of the participants		X^2	P –Value
		Female (%)	Male (%)		
Age (Years)				2.383	0.304
18-34	108	82.1	70.9		
35-51	29	16.7	27.3		
52-64	2	1.2	1.8		
Marital Status				11.021*	0.004
Married	53	27.7	54.5		
Single	86	72.3	45.5		
Education Level				13.274*	0.010
Not Completed Primary School	2	0	3.6		
Not Completed Secondary School	11	9.5	5.5		
Completed Secondary School	37	26.2	27.3		
Diploma/Degree	81	63.1	50.9		
Masters and above	8	1.2	12.7		
Home Ownership Status				1.431	0.839
Self- Owned	20	13.3	16.4		
Rented	5	67.5	69.1		
Hosted by a relative for free	24	19.3	14.5		
Income Ranges (Ksh)				10.323	0.738
<10,000	15	12.0	9.1		
10,001 – 20,000	57	45.8	32.7		
20,001 – 40,000	23	15.7	18.2		
40,001 – 60,000	9	6.0	7.3		
60,001 – 80,000	6	6.0	1.8		
80,001 – 100,000	6	2.4	7.3		
>100,001	16	7.2	18.2		
No Income	7	4.8	5.5		

*Significant (P< 0.05)

3.1.1 Age specific sources of livelihood income for the adults in Westlands constituency

In this study, the economic status of the study participants was determined by means of income (Table 2).

Table-2: Distribution of study participants grouped by gender according to Socio demographic characteristics in Westlands constituency, Nairobi County

	Adult classification by age (%)				
Characteristics	**18-24**	**25-50**	**51-64**	X^2	**P- Value**
Source of Income**					
Wage/Salary	18.0	39.6	2.2	3.157	0.190
Self employment	3.6	20.9	1.4	11.679	0.003*
Farming, crop/animal sales	0.0	1.4	0.0	2.006	0.565
Casual labour	1.4	5.0	0.7	3.115	0.210
Remittances/gifts	12.9	1.4	0.0	28.133	0.000*
Government Aid/ Grants	0.7	0.7	0.0	1.657	1.000

*Significant (P< 0.05)

**Multiple responses were allowed for the source of income

3.2 Knowledge, perceptions and the prevalence of dietary supplement use by the adults between the ages of 18-64 in Westlands constituency, Kenya

3.2.1 The level of knowledge on dietary supplement use between supplement users and non supplement users in Westlands constituency

When determining the level of knowledge on dietary supplements, the response rate was 100% among the adults. Eight true or false questions were administered to the study participants (Table 3). Whereby, all the statements in the table below were false. The highest obtained score was 75% and the lowest score was 0%. The mean percent score was 43.44±17.179. About 21.6% of the study population indicted that dietary supplements should be used to replace meals. A majority of these partipants were single and holders of a degree/diploma. About 78.4% indicated that this statement was false. Majority of these participants were holders of a master's degree and from a middle income socio economic status.

When the respondents were asked if dietary supplements can be taken by anyone irrespective of their health status, 47.5% said the statement was true. Then 52.5% of the adults indicated that the statement was false. About 71.9 % of the respondents indicated that dietary supplements can be used to prevent nutritional deficiencies. Whilst 28.1% indicated that supplements cannot prevent nutritional deficiencies. The results on the knowledge on dietary supplements were segregated according to supplement use and non-use. Whereby, there was a non-significant difference in the dietary supplement knowledge mean score between dietary supplement users and non-users (t= 0.262, df= 137, p= 0.794).

Table-1: Distribution of the responses obtained from the supplement knowledge quiz between dietary supplement users and non-supplement users in Westlands constituency

Statement	Non supplement users (%) who obtained correct response	Supplement users(%) who obtained correct response	X^2	P – value
D.S contains vitamins only.	33.9	5.0	6.839	0.015*
D.S should be used to replace meals.	24.6	15.0	0.956	0.409
D.S has no side effects since they contain nutrients found in food.	38.1	45.0	0.338	0.624
Since protein is a major component of food, one can consume protein supplements and not have associated adverse outcomes.	50.0	40.0	0.685	0.473
D.S can be taken together with any medication.	61.9	85.0	4.035	0.073
One doesn't have to inform the health worker about using D.S when consulting the health worker due to a sickness.	47.5	55.0	0.389	0.631
D.S cannot be used to prevent nutritional deficiency.	66.9	70.0	0.072	0.8 06
D.S can be taken by anyone irrespective of their health status since they contain nutrients.	28.8	25.0	0.123	0.796

* Significant (P< 0.05 level)
D.S- Dietary supplements

The level of knowledge on supplements was determined by further segregating the adults into their location within Westlands constituency as shown (Figure 2). Whereby, there was no significant difference in the knowledge on the various ingredients that make up supplements among the adults in the different wards in Westlands constituency (X^2= 0.999, df= 4, p= 0.910).

Karura ward had the highest proportions (35.7%) of adults who had knowledge on good dietary intake practices in conjunction with supplement use among the different wards in Westlands constituency. However, there was no statistically significant difference in the level of knowledge on the potential adverse reactions related to nutrient intake from supplements and food between the wards (X^2= 8.130, df= 4, p= 0.087). Once again, the residents in Karura ward had the largest proportions (64.3%) of adults who had knowledge on the potential adverse outcomes related to the use of protein supplements compared to the adults residing in the other wards. The difference in knowledge concerning the use of muscle hypertrophy supplements was statistically significant among the adults in the different wards (X^2= 10.168, df= 4, p= 0.038).

Concerning nutrient-drug interactions, the largest proportion (73.1%) of adults in Loresho ward had more knowledge compared to the adults in the other wards. However, the difference in the level of knowledge was not statistically significant (X^2= 2.500, df= 4, p= 0.645). With regards to disclosing the use of dietary supplement use in cases of consultations with health workers due to morbidity. Kangemi ward had the largest proportions (79.3%) of adults who stated the importance of disclosing compared to the other wards

that had more than half of the population who did not see the need to disclose. The results indicated a statistically significant difference in the importance of supplement use disclosure to health workers in case of a sickness among the adults in Westlands constituency (X^2= 14.816, df= 4, p= 0.005).

Mountain View ward had the largest proportions (85.7%) of adults who were knowledgeable on the use of supplements to prevent nutritional deficiency. The residents in Kangemi ward had the least proportions (48.3%) of adults who were knowledgeable. This indicated a statistically significant difference in the knowledge among the adults in all the wards (X^2= 15.676, df= 4, p= 0.003). Lastly, most of the adults in all the different wards had insufficient knowledge concerning the use of dietary supplements in populations with morbidities. The results were not statistically significant between the wards (X^2= 6.428, df= 4, p= 0.169). Whereby, more than 50% of the adults believed that dietary supplements can be taken by anyone irrespective of their health status since dietary supplements contain nutrients.

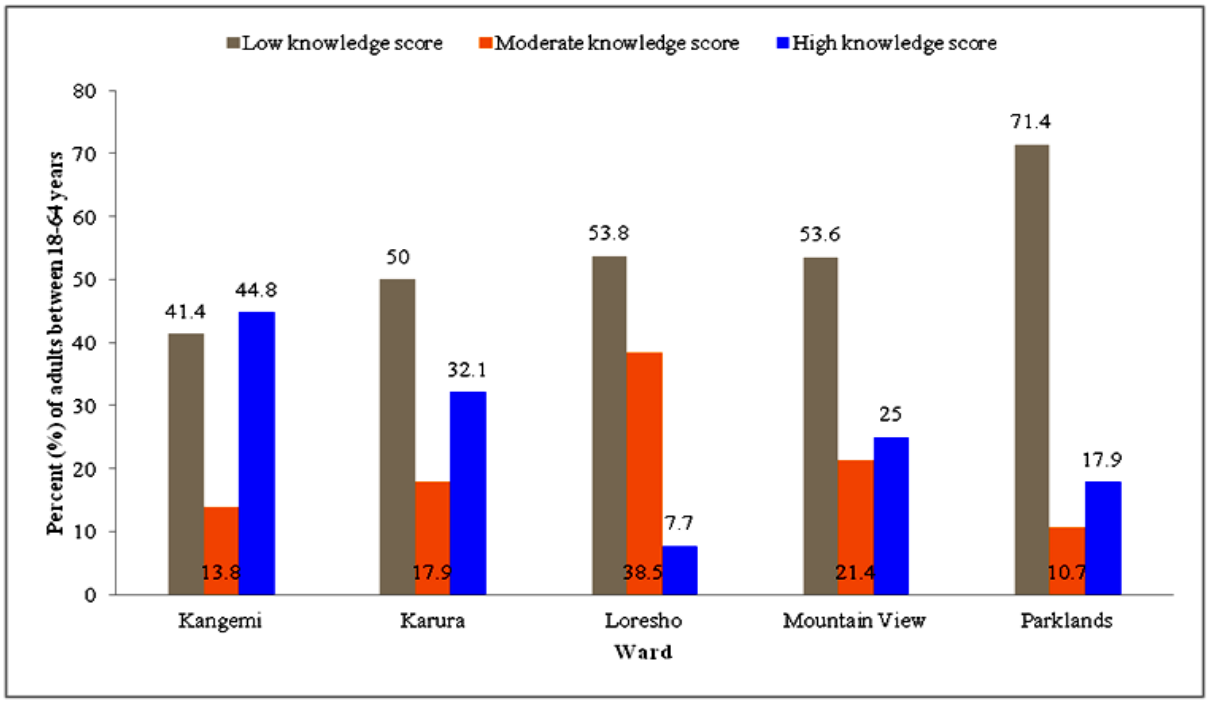

Fig-2: Distribution of the supplement knowledge scores obtained by the adults between the ages 18-64 years within the different wards in Westlands constituency

Some demographic characteristics were selected, together with practices on supplement use to determine the relationship to the level of knowledge on supplements among the adults in Westlands constituency (Table 4). The results indicate that there was a large proportion (20.14%) of adults between the ages 18-36 years who obtained high knowledge scores compared to the other age groups. However, the level of knowledge among the adults' age groups was not statistically significant because 0.025% of the variability in knowledge score was due to the variance in age.

The results indicated a statistically higher mean score (46.536± 16.8287) attained by the female participants compared to the mean score (39.545± 16.0950) obtained by the males using an independent t-test (t= 2.431, df= 136, p= 0.016). The largest proportion (24.1) of the female respondents had low knowledge on supplements, while the largest proportion (30.9) of males had marginally lower knowledge on supplements. Most of the adults in Westlands constituency showed a decrease in knowledge on dietary supplements between genders. However, the relationship was not statistically different since gender shared approximately 3.35% of its variability with overall knowledge score.

The study participant's level of knowledge on dietary supplements relatively reduced with the increase in level of education among the adults in Westlands constituency. However, the relationship between knowledge score obtained and the acquired education level was not statistically significant within the different age groups. The largest proportion (33.09%) of the study participants in Westlands constituency obtained low knowledge scores. These adults were holders of a degree/diploma. However, the relationship between knowledge score and education level was not statistically significant since the level of acquired education shared only 0.58% of its variability with supplement knowledge scores.

Table-4: Distribution of selected demographic characteristics and supplement use of adults in Westlands constituency to determine the level of knowledge on supplements

Characteristic	Knowledge Score			X^2	r	P value
	Low	Moderate	High			
Age				1.619	0.015	0.178
18-34	27.8	46.3	25.9			
35- 51	31.0	44.8	24.1			
52- 64	0	50	50			
Sex				4.777	-0.183	0.031*
Female	47.6	20.2	32.1			
Male	63.6	20	16.4			
Education level				9.928	-0.076	0.371
Not completed primary school	50.0	0	50.0			
Not completed secondary school	54.5	18.2	27.3			
Completed secondary school	45.9	29.7	24.3			
Diploma/Degree	56.8	14.8	28.4			
Masters and above	62.5	37.5	0			
Supplement Use				3.585	-0.100	0.888
Non- supplement users	25.4	48.3	26.3			
Supplement users	45.0	30.0	25.0			

* Significant (P< 0.05 level)
r- Correlation coefficient
Low knowledge score (0- 25%)
Moderate knowledge score (26- 50%)
High knowledge score (51-75%)

3.2.2 Perceptions on dietary supplements between supplement users and non-supplement users in Westlands constituency

Three open ended questions in the questionnaire were used to determine the perception on dietary supplements according to the adults in Westlands constituency. These included the definition of dietary supplements, the ingredients that dietary supplements contain and naming a reliable source of information on dietary supplement use. Whereby, the adults used different phrases to define what a dietary supplement is and all the responses attained were nutrient related. Only 8.6% of the total population responded by indicating that they did not know. The results indicated that a majority of the adults in Westlands constituency associated dietary supplements with drugs containing extra nutrients to boost immunity.

The largest proportion (29.5%) of the adults in Westlands constituency indicated that various nutrient elements are the ingredients that make up dietary supplements (Table 5). Most of these adults had a degree/diploma compared to those who finished form four who indicated that they had no knowledge on the ingredients that make up supplements. However, there was no significant difference in the perceived ingredients among the adults within the different education levels (X^2/Likelihood ratio= 30.572, df= 28, p= 0.336). Also a slight difference that was not statistically significant was observed in the mean of the perceived ingredients that make up supplements between dietary supplement users and non users (t= 1.196, df= 136, p= 0.234).

Table-5: Distribution of the perceptions on dietary supplements among adults between the ages of 18-64 years in Westlands constituency

Characteristic	Female (%)	Male (%)	X^2	P value
Ingredients			7.774	0.353
Nutrients	65.1	72.7		
Food	10.8	5.5		
Virus	1.2	0		
Medicine	4.8	7.3		
Appetizers	2.4	0		
Pills	1.2	0		
Don’t know	14.5	12.7		
Chemicals	0	1.8		
Reliable source of information			17.606	0.128
Chemist	0	1.8		
Doctor	32.5	32.7		

Characteristic	Female (%)	Male (%)	X^2	P value
Vegetable kiosks	0	1.8		
Friend	0	1.8		
Gym instructor	1.2	3.6		
Internet	0	1.8		
Media	1.2	0		
Nurse	15.7	7.3		
Nutritionist	34.9	25.5		
Parents	0	1.8		
Pharmacist	10.8	10.9		
Self	0	1.8		
Don't know	3.6	9.1		

* Significant (P< 0.05 level)

3.2.3 Use of dietary supplements among the adults between 18-64 years in Westlands constituency, Nairobi County

There were no dietary supplement users above 54 years in this study. In total, only 14.4% of the study population indicated to have used various types of dietary supplements in the past 12 months (Figure 3).

The proportions (33.3%) of males who used protein supplements wanted to improve muscle hypertrophy. While, only 16.7% of the proportions of males who took creatine wanted to improve physical performance and no undesirable effects were experienced.

The data on supplement use within the past 12 months was further segregated according to the adults' location within Westlands constituency. Whereby, supplement use was not statistically different among the adults between the different wards within Westlands constituency (X^2/Likelihood ratio= 4.379, df= 4, p= 0.357).

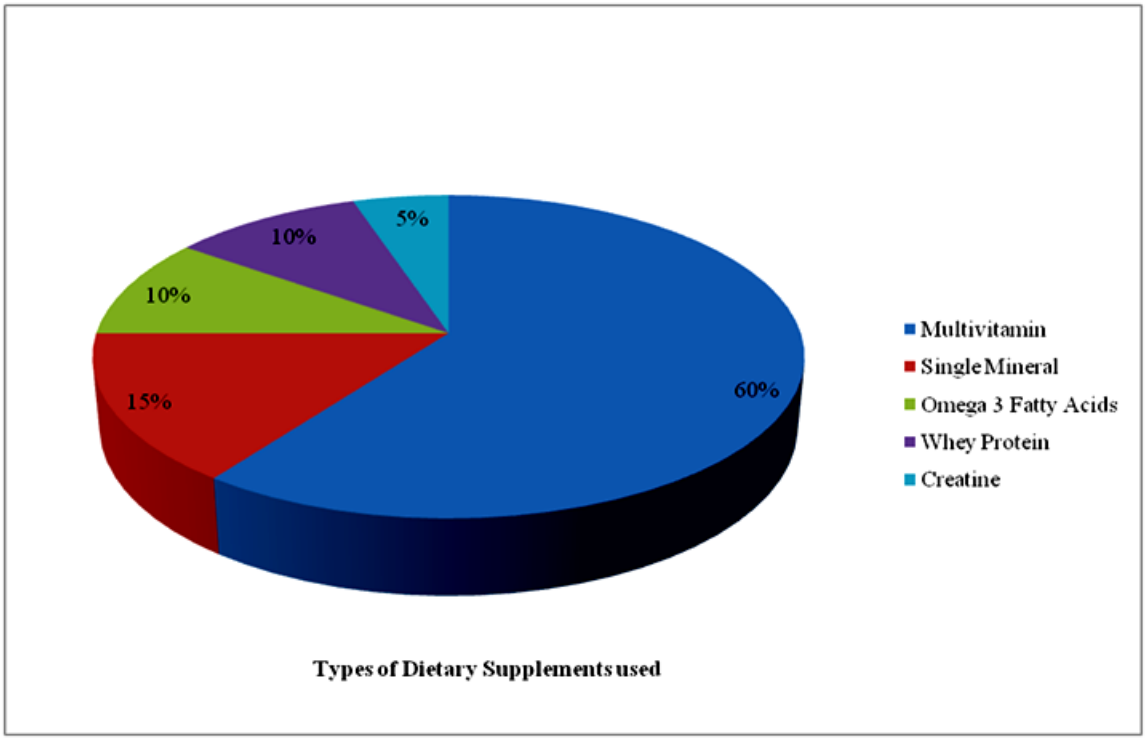

Fig-3: Distribution of the different types of dietary supplements used by the study participants' between the ages 18-64 in Westlands constituency, Nairobi County

Prior knowledge on the supplements used by the adults in Westlands constituency was from different sources (Table 6). There were no females in this study who obtained information on supplements from a coach, gym instructor and pharmacist. Most of the females did their own personal research on dietary supplements while the males got information from pharmacists. No males received prior information on the supplements used from either a nurse or doctor. The main source of the dietary supplements was from pharmacists even though both females and males got prescription from a medical practitioner.

Table-6: Distribution of the sources of information, person who prescribed supplement use and the different sources where the supplements were purchased from grouped by the gender of the supplement users in Westlands constituency

Characteristics	Female (%)	Male (%)	X^2	P- value
Source of information on the dietary supplements used			15.920	0.021*
Internet	42.9	16.7		
Coach	0	16.7		
Gym instructor	0	16.7		
Pharmacist	0	33.3		
Nurse	28.6	0		
Nutritionist	7.1	16.7		
Doctor	21.4	0		
Personnel who prescribed the supplements used			14.004	0.009*
Self	21.4	0		
Gym instructor	0	33.3		
Pharmacist	14.3	0		
Nutritionist	0	33.3		
Medical practitioner	64.3	33.4		
Source where supplements used were purchased from			7.213	0.120
Sales person	0	33.3		
Supermarket	28.6	16.7		
Chemist	50	50		
Clinic	21.4	0		

***** Significant ($p<0.05$)

A few of the dietary supplement users experienced undesirable effects as a result of using supplements (Figure 4). The largest proportions (42.9%) of the adults who had side effects were females. The largest proportion of females (14.3%) complained of nausea and vomiting after taking supplements. Other undesirable effects that the female participants complained of were heart burn, after taste, heavy menstrual flow and stomach aches. While, the only side effect that the male participants complained of was typically an after taste. No males felt heartburn, stomach aches, nausea and vomiting. In this study, male supplement users had the largest proportion (66.7%) of adults who had no side effects due to dietary supplement use compared to the proportion (57.1%) of females who had no side effects.

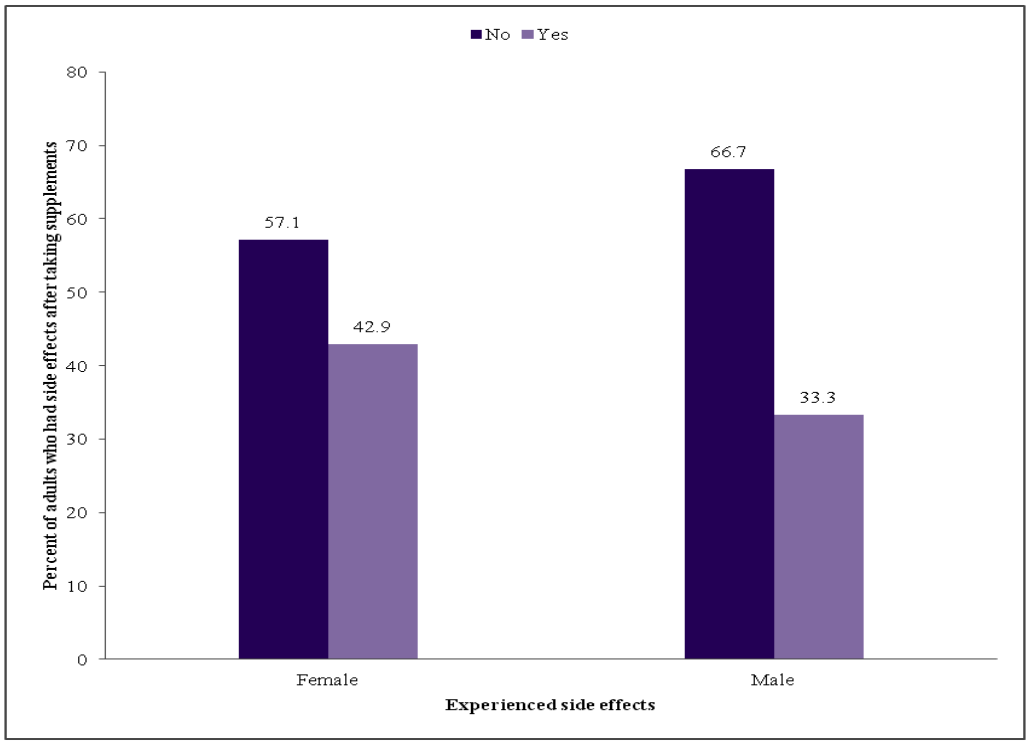

Fig-4: Undesirable effect experiences of the adults who were using supplements in Westlands constituency grouped by gender

Over 50% of the supplement users were taking supplements by prescription due to an underlying health problem (Table 7). The largest proportions (28.6%) of female were taking mineral supplements due to anaemia. However, 7.1% of these females complained of a heavy menstrual flow after taking mineral supplements. About 16.7% of the males took multivitamins due to scurvy and unfortunately complained about an aftertaste.

In this study, only 14.3% of the females were taking mineral supplements (Iron and folic acids) because of pregnancy. These women reported to have experienced nausea and vomiting after taking mineral supplements obtained from the county clinics. The proportions (14.3%) of females who were diagnosed with osteomalacia were taking multivitamin supplements. They had no undesirable effect felt due to dietary supplement intake.

Table-7: Reasons for prescribing the supplements used and the side effects experienced after supplement use among the adults in Westlands constituency grouped by gender

Characteristic	Female %	Male %	X^2	P-value
Diagnosis			15.070	0.089
Antenatal care	14.3	0		
Anaemia	28.6	0		
Appetite improvement	7.1	0		
Brain and heart health improvement	14.3	16.7		
Improve vitamin intake	7.1	16.7		
Muscle hypertrophy	0	33.3		
Osteomalacia	14.3	0		
Reduce fatigue	0	16.7		
Scurvy	7.1	16.7		
Ulcers	7.1	0		
Undesirable effect			5.339	0.376
None	57.1	66.7		
After taste	7.1	33.3		
Heartburn	7.1	0		
Heavy menstrual flow	7.1	0		
Nausea and vomiting	14.3	0		
Stomach aches	7.1	0		

***** Significant ($p<0.05$)

4. DISCUSSION

4.1 Socio-demographic characteristics of the adults between the ages 18-64 years in Westlands constituency, Nairobi County

Westlands constituency is a place of striking contrast between its slum and high income areas. It constitutes of an educated youthful population, particularly more females than males from the age cohorts 18 to 34 years. This finding is in accordance with KNDS (2019), whereby there are sex disparities in the population in Nairobi County. The urban economic structure predominantly evolves due to forces of urbanization and socio demographic structures among other factors. The adults in Westlands constituency consisted of a labour force actively contributing to the country's economic growth through nonfarm related sources of livelihood. According to Pingali and Sunder (2017), more people in urban areas are moving out of agriculture as a source of a livelihood and resort to non-farm related economic opportunities because the modernization of agricultural systems has resulted in developed markets which requires high technology skilled labour. This demonstrates the importance of non-farm livelihoods in urban communities to ensure dietary diversity and food security (Mishra and Rahman, 2018).

Most of the adults in this study had low income security for the acquired level of education. For most Kenyans, supplements are considered to be expensive and targeted for elite individuals (Euromonitor International, 2020). For that reason, the motivation for supplement use by most of the study participants was due to a medical condition and not a personal preference. This demonstrates the vulnerability of these adults to micronutrient deficiencies. Therefore, economic reforms are necessary to increase bargaining power of nutritious and diversified diets for socially excluded individuals to decrease the vulnerability to the impact of hidden hunger. The study population consisted of mostly low to middle income earners and the knowledge on dietary supplements was unsatisfactory. In other studies, a higher income is normally associated with a higher use of dietary supplement usage (Cowan *et al.*, 2018). However, the revelation of this study was the opposite. Therefore, more research needs be done to understand the determinants that influence supplement usage. This will also to allow a proper outline of relevant public health education.

4.2 Level of knowledge and perceptions on dietary supplement use between supplement users and non-supplement users in Westlands constituency

The study participants perceived supplements as; specific foods that boost immunity and improve appetite, food additives, products that are safe for human consumption and used as snacks, elements extracted from both natural and un natural sources to boost the physiology of the human body, body building pills and syrups, drugs obtained from the chemist used to boost vitamin and minerals in the body. These findings show an element of confusion amongst the people. For that reason Mestaghanmi *et al.,* (2021), advocates for the use of sport channels on TV and the introduction of specific courses in institutions to educate on the symptoms, interactions and potential harmful side effects that may arise due to supplement use among populations.

Doctors and nutritionist were reported to be the rightful people who provided appropriate knowledge/advice on the dietary supplements used by most of the people in this study. These findings are a direct contrast with the results of Salam *et al.,* (2020), who reported that more than half of medical students in Saudi did a research on the internet to gather information on the supplements used. Future research should then focus on replicating the same study in non health academia to detect and address any possible differences in order to develop guidelines and policy action.

A study conducted in Bangladesh among female, undergraduate pharmacy students indicated that a majority of the students were not sure on; whether regular use of dietary supplements prevents chronic illnesses, the possibility of adverse side effects, age groups that are considered safe to use supplements, role of supplements in preventing cancer, contribution of supplements in one's optimum health and the rightful health personnel to prescribe the use of supplements (Jahan *et al.,* 2021). It is quite alarming that these learners had doubts on general supplement knowledge, given that one would assume that studying in a medical/health field would generally improve dietary supplement knowledge. This revelation puts emphasis on the urgent need for nutrition education, with a focus on supplements.

The level of knowledge was predominantly low among the adults in Westlands constituency because a majority of the study participants obtained knowledge score in the low threshold. This revelation is worrisome because a majority of the adults who used supplements in this study were degree holders. One would assume that their literacy would better place them in a better position to understand more on the products that they indulge in. Overall, dietary supplement knowledge was inadequate in this sample of adults. In a recent study done among black African and Caribbean women living in the United Kingdom, poor dietary practices minimized the chances of sufficient knowledge on supplements. Presenting an opportunity to educate multi ethnic communities on proper supplement use improve safety and proper use (Adegboye, Ojo and Begum, 2020).

According to Mshanga, Martin and Petrucka, (2021), a large percentage of the Maasai pregnant women were knowledgeable on micronutrients (particularly iron) but they did not translate their knowledge into action (dietary practices). The current study findings are comparable with a study undertaken in Poland by Kołodziej *et al.,* (2019) whereby a significant rate of dietary supplement users demonstrated to have inaccurate information about such products. Therefore, this demonstrates an urgent need for effective ways of translating knowledge into policy and action.

4.3 The use of dietary supplements among adults between the ages 18-64 in West lands constituency, Nairobi County.

A low prevalence of dietary supplement usage was found among the study population. The most common dietary supplements used were multivitamins, with the intention to reduce fatigue, improve appetite, brain health and heart health. This is in accordance with the findings of Awuchi *et al.,* (2020) who reported that multivitamins have many health benefits which include serving as coenzymes and cofactors to enzyme varied enzyme systems, teeth and bone formation, tissue maintenance, aid the regulation and coordination of most body functions, and other physiological and biochemical functions in the body.

This resonates with the findings of this study as more adults had access to supplements over the counter. Either from prescription of a health care worker or other questionable sources which raises concern on proper use and potential health effects in the future.

According to Louca *et al.,* (2021), taking multivitamins is linked to lower the risk of contracting SARS-Covid-2 compared to taking vitamin C supplements among populations in the UK and USA. Also, it has been reported that the wide use of multivitamins is expected because of their easier accessibility compared to other dietary supplements (Owens and Toone, 2014). Easy access to purchasing dietary supplements over the counter and the rigorous advertisement because of the ongoing pandemic demonstrates the need to educate the public to make an informed decision before using supplements for safety reasons.

According to the National Food Fortification Strategic Plan (2018-2022), one of the key priority areas is the improvement of the nutritional status of

women of child bearing age (15-49) by promoting the consumption of nutritious foods and the provision of iron/folate supplements to pregnant women (Government of Kenya, 2018). Progress that is noticeable has been made, however a lot more still needs to be done. It is therefore a cause of concern that a majority of the supplement users in this study were women of child bearing age and diagnosed with anaemia hence the reason for supplement use.

Particularly, the youth were the main consumers of dietary supplements compared to older adults. The main reason for using multivitamins among the females was due to an underlying health problem compared to the males who used creatine and whey protein supplements due to non-medical related reasons. Whereby, the main reason for using dietary supplements by the males was to reduce fatigue and increase muscle hypertrophy. Contrary, the reason for using supplements among the females was for heme synthesis. According to Walle *et al.*, (2020), it is proven that the provision of multiple micronutrients may be more effective in improving maternal outcomes than the use of Iron/folic acid supplements alone amongst pregnant women. Therefore, World Health Organization might have to revise the antenatal care (ANC) guidelines.

Chepng'etich, Bor and Too (2019), reported the same findings among outpatient adults who sought healthcare services in a referral hospital in Kericho County, Kenya. Whereby, over 50% of the adults used supplements that were prescribed by a healthcare professional due to an existing illness. However, multivitamins were the least type of supplement used in their study as opposed to this study where multivitamins were the most consumed. Yet, calcium (single mineral) and vitamin D (single vitamin) were the most consumed dietary supplements in their study.

A similar concern was noted that most of the supplement users lacked knowledge on the function of the supplements used in the body and thus, the urgency for educating the public on dietary supplements, in terms of their function and safe use.

The study review indicated that the use of omega 3 fatty acids among the study participants was the intent to improve brain and heart health. Jaca, Durao and Harbron (2020), echo the same sentiments; that regular use of omega 3 fatty acids (alpha-linolenic acid) relatively reduces the incidence of cardiovascular diseases and related mortality. However, the findings are associated to be true with high income countries. This implies that the effect might not be the same in the African context, Kenya particularly where there is a difference in baseline intake. Interventions should target on ensuring that all communities have access to affordable local foods that are good sources of omega 3 fatty acids (fish, nuts and seeds).

Anaemia is associated with high maternal mortality among women of child bearing age (Akhtar *et al.*, 2013). Therefore, the implementation of the programme aimed at distributing iron/folic acid tablets to pregnant women has been successful in different parts of the country. However, there is still a need for interventions that will enhance the effectiveness of this programme by targeting behavior change and influence the consumption of diversified diets with the inclusion of indigenous fruits and vegetables in urban populations. Particularly, food that is rich in iron and vitamin $B_{12.}$ As more studies have revealed that hidden hunger (micronutrient deficiency) is one of the burdens that are crippling the health system in Kenya due to the consumption of low diet diversity among populations in urban areas.

According to a South African study, the prevalence of dietary supplement use was 2% among university students and the reasons for using supplements were to improve physical health, body conditioning, dietary reasons, and boost energy (Steele and Senekal, 2005). Also, Sirico *et al.*, (2018), states that the main reason for supplement use in Italy by adults is related to the increase in consciousness of the importance of a healthy lifestyle among learned communities and due to the evidence that dietary supplement use is generally treated as an act of being conscious around health issues. The study findings were a direct contrast because even though a majority of the supplements users in this study were holders of a degree/diploma, literacy rate did not influence supplement use in this study as more participants used supplements due to an underlying health problem.

Kangemi and Mountain View had the most adults who used supplements compared to the other wards in Westlands constituency because these are predominantly residential areas for university students and graduate employees working within Nairobi. However, Loresho and Parklands had a few number of adults who used supplements. The present study showed that the most popular sources of information about supplements were medical practitioners, friends, self-research, pharmacist, nutritionist and gym instructors respectively. A majority of the females bought the supplements used from pharmacies and supermarkets respectively and the male respondents purchased whey protein and creatine supplements from pharmacies and sales persons respectively.

The findings of Mazzilli *et al.*, (2021), revealed that whey proteins and creatine were mostly used by the study participants (gym users and gym instructors) for fitness training. However, the major concern is that other authors indicate that an overuse of protein supplements can be detrimal to one's health in the future. Therefore, it is the responsibility of the suppliers to ensure that their consumers are aware of the prons and cons of the supplements used. Even though a

majority of the supplement users got prescription from a healthcare worker for the supplements used, it is worrisome that most of these people lacked comprehensive knowledge on the supplements they used. Also, the women in this study who were pregnant lacked sufficient knowledge on the iron and/folic acid supplements they were using yet they were attending antenatal classes in county clinics.

As a result, original packaging of the supplements used had to be used to confirm the type and the contents of the supplements used. Riang'a, Nangulu and Broerse (2020), also states that the implementation of nutrition counseling and Iron/Folic Acid policy in Kenya is below par. Therefore, there is a need to advocate for the consumption of locally micronutrient dense diets to counteract for the low rates of compliance to the IFAS supplements. Relevant sectors need to do culture specific research to create seasonal food calendars with recipes and nutrient contents of dishes and share findings with the public through media.

As a basis on the demand and supply of Nutraceuticals in the Kenyan market, this study is proof that access to dietary supplements over the counter without a healthcare professional's prescription has increased over the years in Kenya with vast advertisement of supplements.

As indicated by this study that a majority of the supplement users in this study purchased them over the counter. Females compared to males expressed a higher level of concern regarding side effects but they continued to use the supplements nonetheless. Similar results were obtained when inquiring about the importance of reporting any side effects felt, all the females did not report the undesirable effects to anyone.

A majority of the female respondents reported to have experienced undesirable effects such as heart burn, stomach upset, after taste, heavy menstrual flow, and nausea and vomiting. The reason for adverse reactions among females could be the time interval for the dosage of the supplements used which was taken anytime regardless of the prescription. Contrary, to the findings of Stanojevi *et al.*, (2017), who reported that medical students believed that it was imperative to follow the manufacturer's instructions regarding product usage. This is important to minimize the incidence of adverse health effects.

Jahan *et al.*, (2021), reported that the unpleasant side effects that occurred due to supplement use among female students in Bangladesh included; nausea, vomiting and diarrhea. This echoes similar findings with the current study. Then, this demonstrates the importance of having a body of entities where people can report such incidences for traceability of bogus products and the control of the nutraceutical industry. Thus, sensitizing the public on the function of the Kenya Pharmacy and Poisons Board is critical to ensure precaution and the safety of supplement use. Therefore, there is an urgent need to provide education and access to unbiased and scientific information to the population at large.

5. CONCLUSION

Worldwide, the growth of the Nutraceutical industry has grown tremendously because of the Covid-19 pandemic (Euromonitor International, 2020). Food fortification and supplementation initiatives remain a priority for most populations in developing countries as synthetic forms of essential nutrients are more stable in terms of bioavailability (WHO and FAO, 2018).

Though, the prevalence of supplement use was very low in this study and not significant in all the wards. The use of dietary supplement was predominantly common among middle aged Kenyan women of child bearing age. Interestingly; the results indicated that a higher level of education within the study participants was associated with having less knowledge on supplements. Whereby, the adults generally perceived dietary supplements as nutrients from food and drugs to boost immunity. Aspects of; the reasons for supplement use, sources of valid information on dietary supplements and side effects experienced due to supplement used varied between men and women.

The findings from this study have displayed challenges in knowledge on dietary supplements among the Kenyan population. The main current challenge relates to the limitation in culture specific research. Future research should put more emphasis on strengthening education targeted on unbiased information on dietary supplements and diversified diets through mainstream media.

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