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Dietary Practices and Nutrition Status of Adult Pulmonary Tuberculosis Patients Attending Nyeri County Referral Hospital, Kenya

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Abstract: The purpose of this study was to assess the dietary practices and nutrition status of adult pulmonary TB patients attending Nyeri County Referral Hospital, Kenya. The study adopted a cross-sectional analytical design. A sample of 135 participants was calculated using the modified Fisher Formula. The study targeted adult pulmonary TB patients attending TB Clinic. A structured questionnaire and a focus group discussion guide were used to collect data. Data was analyzed using Statistical Package for Social Sciences. About 48.1% of the participants were underweight while 45.9% were normal and 3.7% were overweight. Chi-square tests showed significant relationships between gender ($\chi 2 = 10.917$, $p=0.012$), age ($\chi 2 = 12.261$, $p=0.046$) and income ($\chi 2$ 15.584, = $p=0.036$) were significant to nutrition status among the socio-demographic characteristics. Pearson correlation analysis showed a weak relationship ($r=0.173$, $p=0.045$) between number of meals per day and nutrition status of TB patients. The study concluded that adult pulmonary TB patients attending Nyeri county referral hospital had poor dietary practices, which led to poor nutrition status. The study recommended that food assistance programs should be strengthened by the government in conjunction with non-governmental organizations to help in mitigating increased vulnerability to food insecurity among TB-affected households.

Keywords: Dietary Practices, Extra Pulmonary T.B, Nutrition Status, TB Patient and Pulmonary T.B

INTRODUCTION

Tuberculosis is a contagious disease related to poverty, under nutrition and poor immune function. Tuberculosis is a global public health problem that is responsible for high morbidity and mortality worldwide. Each year approximately 8 million people are infected with TB worldwide [1]. Tuberculosis new infections are around 8 million with about 1.5 million of the cases being in sub Saharan Africa. Africa holds the highest incidence of TB per population units. In Sub Sahara Africa, up to 70% of people are infected with TB with 9000 cases being reported each year. Tuberculosis incidence has risen in the last two decades due to the emergence of HIV/AIDS which weakens immunity. Kenya is among the twenty-two hardest hit countries with over 300 cases per 100,000 people. In 2009, Kenya had over one hundred and thirty-two thousand new TB cases with an incidence of 312 cases per every 100,000 people [1]. Nyeri County notified a total of 1478 cases; National Tuberculosis and Leprosy Diagnostic Unit, 2013. Pulmonary TB cases were 1,262 accounting to 85.4% and extra pulmonary TB cases were 216 accounting to 14.6 %; Nyeri County Referral Hospital Medical Record Data, 2013. The incidence of TB in Nyeri County was 82 per 100,000 people whereas the prevalence was 198 per 100,000 people which was slightly lower than the national average of 223/100,000 people (NTLDU, 2013).

Tuberculosis is a disease caused by Mycobacterium tuberculosis. Mycobacterium tuberculosis can occur in any organ but is mainly found in the lungs. Infection with M. tuberculosis leads to formation of tubercles [2]. Jeon *et al.* [3] indicated that TB diagnosis presents challenges because its signs and symptoms are very similar to those of many other diseases especially respiratory diseases. Goldhabert *et al.* [4] explains that infection with Tuberculosis is characterized by night sweats, breathlessness and hemoptysis. However, Jahnava and Sudha indicated that 90% of those infected with M. tuberculosis will never develop the disease because of their immune response. Martin *et al.* [5] adds that an immune response successfully contains Tuberculosis infection but does not eliminate. According to Schurr and Alcais [31], a weakened immune response due to substance abuse, ageing, HIV/AIDS or poor nutrition status may bring about active infection. This is because without a proper immune response, the natural history of the disease is altered leading to a long a latency stage. People living with HIV/AIDS, can become sick with the disease within weeks as opposed to years and

decades. People living in informal settlements or slums are at a greater risk of TB transmission due to overcrowding and poor ventilation [6].

Tuberculosis leads to severe wasting [7]. According to NCRHMRD (2013), TB HIV co infection rate of patients attending Nyeri County Referral Hospital was at 34%, while under nutrition among TB cases at diagnosis was 43% with severe and moderate malnutrition accounting for 23%.

STATEMENT OF THE PROBLEM

Under nutrition speeds up the progression of TB from infection to active tuberculosis. In addition, under nutrition is associated with increased risk of death and relapse of the diseases [7]. Under nutrition also affects the treatment process of tuberculosis [32]. Poor dietary and feeding practices impede the fight against TB especially in developing countries. To make matters worse, TB is accompanied by other diseases that adversely affect the nutrition status [8]. Further, TB medications have side effects that make it hard for the patient to eat.

Some drugs such as Isoniazid cause nausea and loss of appetite while Rifampicin causes vomiting and abdominal cramping. A study by Nthiga *et al.* [9] assessed dietary practices. However, no study has assessed Nutrition Status and the relationship. There is minimal information on the relationship between dietary practices and nutrition status among TB patients in Nyeri County despite the growing health problem. It was against this backdrop that the study sought to assess dietary practices and nutrition status of adult TB patients attending Nyeri County Referral Hospital, Kenya.

OBJECTIVES

I. Establish the demographic and socio-economic characteristics of adult pulmonary TB patients attending Nyeri County Referral Hospital.
II. Determine the dietary practices among adult pulmonary TB patients attending Nyeri County Referral Hospital.
III. Determine the nutrition status among adult pulmonary TB patients attending Nyeri County Referral Hospital.
IV. Establish the relationship between demographic and socio-economic characteristics, dietary practices, and nutrition status among adult pulmonary TB patients attending Nyeri County Referral Hospital.

Hypotheses

H_{01}: There is no significant relationship between demographic and socio economic characteristics and nutrition status among adult pulmonary TB patients attending Nyeri County Referral Hospital.

H_{02}: There is no significant relationship between dietary practices and nutrition status among adult pulmonary TB patients attending Nyeri County Referral Hospital.

LITERATURE REVIEW

Demographic and Socio Economic Characteristics among TB Patients

Although Tuberculosis affects people from all age groups, the disease is mainly found among men (WHO, 2013). During the course of diagnosing, treating and caring from TB patients, families incur great expenses leading to health expenditure [10]. World Health Organization [12] reports that seventy-five percent of those affected by TB are between fifteen and fifty-four years which are the prime working years. Jayasuriya *et al.* [12] add that families with a TB patient face financial problems due to reduced income and high medical expenses. Patients are too sick to work and therefore their families have to meet the expenses.

Schurr and Alcais [31] indicate that there is a high incidence of tuberculosis among people of low socio economic status. This is because, such people, due to their low income, live in crowded housing which provides a favorable for tubercle bacilli to thrive and transmit. In addition, Mullie *et al.* [10] observe that poverty limits the dietary options among TB patients. Ivers and Cullen [13] add that patients in such conditions are forced to consume fewer meals. Jayasuriya *et al.* [12] sought to study the nutrition status among TB patients and its associations with food security. The study found that 9% of the households were reported to be below the poverty line and 6% of the households with TB patients were reported to be food insecure. However, the authors warned that the food insecurity index was based on rural set up combined with the fact that 9% use more than 65% of their income on food. The point of departure is that this study was conducted in Sri Lanka. This study therefore sought to assess the demographic and socio-economic characteristics of adult TB patients attending Nyeri County Referral Hospital, Kenya.

Dietary Practices among TB Patients

Nutrition and dietary habits play an important role in the prevention and treatment of TB [10]. Nutritional deficiencies are generally associated with an increased risk for contracting TB and have an effect on the severity of the disease. The poorer the diet, the more likely the person will develop complications associated with the disease. In

addition, the nutrition status is adversely affected after patients have been infected [14]. Poor feeding practices undermine efforts to combat unacceptably high rates of tuberculosis in developing countries [15].

The nutrition status dietary intake and utilization of nutrients are profoundly altered during the body's response to infection. According to Martin *et al.* [5] factors that affect food intake are also very important to consider. They include feeding frequency, low dietary diversity, inadequate dietary quantity, and diets with poor quality [16]. According to Sharma and Sharma many medications that treat active TB have side effect that can decrease food intake because some drugs causes loss of appetite, nausea, vomiting and abdominal cramping. There is limited information on dietary practices among TB patients. This study therefore sought to determine the dietary practices among adult TB patients attending Nyeri County Referral Hospital.

Relationship between TB and Nutrition Status

The association between TB and under nutrition has long been known [17]. Tuberculosis worsens nutrition status and poor nutrition weakens immunity, thereby increasing the likelihood that latent TB will develop into active disease [18]. Most people with dynamic TB are in a catabolic state and experience weight reduction and some hint at vitamin and mineral lacks at conclusion. Weight loss among TB patients is prevalent due to nausea, abdominal cramps, lack of appetite, vomiting and diarrhea which lead to nutrient losses. This leads to TB patients being at a greater risk of death [11].

Prior to the coming of hostile to tuberculosis chemotherapy, an eating regimen rich in calories, proteins, fats, minerals, and vitamins was by and large thought to be imperative, if not basic factor in treatment of TB [19]. The presentation of particular against tuberculosis drugs, in any case, has so drastically changed the administration of the ailment that the part of eating routine ought to be considered in the light of the advances in treatment [20]. Rifampicin (RIF), isoniazid (INH), pyrazinamid (PZA) and ethambutol are first line drugs used for the treatment of tuberculosis. According to Pakasi *et al.* [21] vitamin D, calcium and folic acid levels are lowered in the body when using Isoniazid. Niacin, Vitamin E and magnesium may also be depleted with long term isoniazid use. Rifampin may affect vitamin D levels and it may need to be supplemented. Sharma and Sharma indicated that the four drugs lead to nutritional optic neuropathy. Nutritional optic neuropathy occurs mainly due to deficiencies of thiamine (vitamin B1), cyanocobalamin (vitamin B12), pyridoxine (vitamin B6), niacin (vitamin B3), riboflavin (vitamin B2), and/or folic acid.

Martins *et al.* [5] found that patients receiving midday meal and take home ration had 10.1% weight gain over 7.5% in controls. In an Indian study, Allen *et al.* [22] found that patients who received food supplements had a significant increase in body weight (8.6 percent versus 2.6 percent, p-value <0.001). Kang *et al.* [30] found that TB patients on early nutritional intervention had significantly greater increase in body weight total lean mass than control group. Simple, low cost incentives can be used to improve adherence to TB preventive therapy in indigent adults according to [23]. In PrayGod *et al.* [17] study, two-third of tuberculosis patients was underweight at the time of diagnosis. However, after initiation of anti- tuberculosis drug there were significant increments in weight gain. The weight gain of patients was affected by educational status, history of previous tuberculosis treatment and meal frequency per day. Lai, Lai and Yen [24] found evidence of chronic under nutrition in TB patients before and after treatment. The same finding was shared by Bhargava [14] who found that even after treatment majority of patients had a chronic severe under nutrition signaling the need for nutritional support during treatment. Weight gain during treatment is therefore an unreliable sign of immune response [25]. Empirical findings studies on the relationship between TB and nutrition status is limited. This study therefore sought to establish the relationship between dietary practices and nutrition status among adult TB patients attending Nyeri County Referral Hospital.

Conceptual framework

Malnutrition can be an important barrier for accessing and adhering to TB treatment. Catastrophic costs of TB illness and TB care can increase malnutrition. There is often a vicious circle of underlying vulnerability leading to TB and TB leading to aggravated vulnerability. Experiences suggest that food support can be a critical component of enablers and social protection packages.

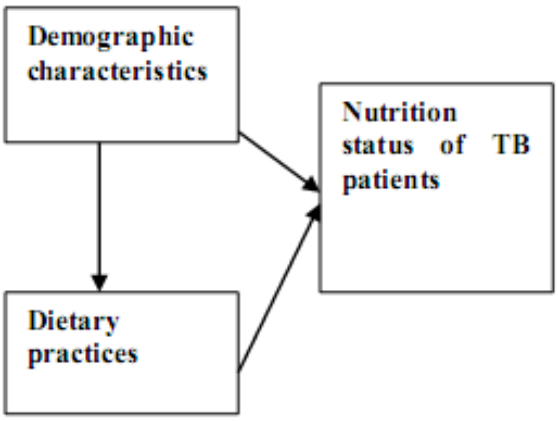

Fig-1: Independent variables Dependent variable

Although Tuberculosis affects people from all age groups, the disease is mainly found among men. There is also a high incidence of tuberculosis among people of low socio economic status. Nutritional deficiencies are generally associated with an increased risk for contracting TB and have an effect on the severity of the disease. Tuberculosis worsens nutrition status and poor nutrition weakens immunity, thereby increasing the likelihood that latent TB will develop into active disease. In this study, dietary practices were indicated by the number of meals per day, amount of energy/caloric intake, macro nutrients which included carbohydrates, proteins and fats and micronutrients intake which included vitamins A, D, E, B6, B12, iron and zinc and the frequency of consumption of selected food. Body Mass Index indicated the nutrition status.

Summary and Gaps to be filled

Literature review focused on dietary practices and nutrition status of patients suffering from pulmonary TB. The literature review established that under nutrition makes people vulnerable to TB and in turn TB aggravates malnutrition and finally leads to severe wasting and death. Reviewed literature also indicated that Food and nutrition activities support nutritional stabilization and recovery, resulting in increased immune system strength, faster sputum clearance and faster weight gain. In Nyeri and Kenya at large, few studies have been carried out on the nutrition status of TB patients and its relationship to dietary practices. Empirical review of studies shows that what is done is descriptive analysis of dietary practices leaving a gap in relating dietary practices with nutrition status. This study sought to fill this gap relating the dietary practices and nutrition status of adult pulmonary TB patients attending Nyeri County Referral Hospital, Kenya.

RESEARCH METHODOLOGY

Research Design

The study adopted a cross-sectional analytical study design. The study aimed to relate dietary practices and nutrition status of adult pulmonary TB patients attending Nyeri County referral hospital. The benefit of a cross-sectional study design is that it allows researchers to relate or compare many different variables at the same time [29]. The design was appropriate because the main interest was to explore the viable relationship and describe how the factors support matters under investigation.

Target population

The study population was adult pulmonary TB patients attending Nyeri County Referral Hospital TB Clinic. Adults' pulmonary TB patients were selected because past medical records from the Nyeri County Referral Hospital showed that 85.4% of TB patients were aged over 18 years and had pulmonary TB. Selection of Nyeri County Referral Hospital was justified because it received patients from all over Nyeri County and beyond which justified generalization of the findings. The study included adult pulmonary TB patients attending Nyeri County Referral Hospital TB clinic who gave consent. Patients who were too ill to respond and those who declined to give informed consent were excluded from the study.

Sampling Procedure

To obtain a representative sample, the sample size was determined using Fisher formula; 1956.

$$n = \frac{z^2 p\,(1-p)}{d^2}$$

z = is the Z value for the corresponding confidence level (i.e., 1.96 for 95% confidence);
d = is the margin of error (i.e., 0.05 = ± 5%) and

p = is the estimated value for the proportion of a sample that have TB.
P= 19.8% (the most conservative estimate) =0.198

$$n=\frac{1.96^2 p\,(1-p)}{d^2}$$

$$n=\frac{1.96 \times 1.96 \times 0.198\,(1-0.198)}{0.05 \times 0.05} = 236$$

For a population less than 10,000 the following formula by Fisher is used;

$$nf=\frac{n}{1+(n/N)}$$

Where *nf is* the desired sample when the population is less than 10,000
n is the sample when the total population is more than 10,000
N is the estimated population of TB patients for 4 months (305) NCRH, 2016

nf = 236 / 1 + (236/305) = 133

However, the calculated sample size was inflated by 10% to cater for non-response to make a sample of 149. From the list available at the TB clinic, systematic sampling method was used where every 2nd patient was taken until a sample of 135 was achieved.

Data collection

The study employed a structured questionnaire and focuses a group discussion guide to collect data. The questionnaire had open and close ended questions. The questions focused on socio demographic and economic characteristics, dietary practices and nutrition status of TB patients. A focus group discussion (FGD) guide was used to collect additional information on dietary practices from adult pulmonary TB patients attending Nyeri County Referral Hospital. Pre-testing was conducted to establish accuracy of questions, clarity and to determine the length of interviews. Validity of instruments was ensured by formulating the relevant questions according to the study objectives. Instrument validity was further established by undertaking a pretest.

Data Analysis

Demographic, socio-economic data, dietary and nutrition status data was summarized using descriptive statistics which included frequencies, percentages, mean and standard deviation. Chi-square tests were performed to establish relationships demographic and socio- economic characteristics and nutrition status, gender and dietary practices and nutrition status. Pearson correlation coefficient (r) was used to determine association between dietary practices and nutrition status and between duration of taking medication and nutrition status. Findings were presented using tables, figures and charts.

Logistical and Ethical Considerations

Proposal approval was sought from Kenyatta University Graduate School. Ethical clearance was obtained from Kenyatta University Ethical Review Committee. A research permit was sought from the National Commission for Science, Technology and Innovation. Authorization to conduct the study was obtained from the Director of Health Services Nyeri County. Informed consent was sought from the respondents before administering the questionnaire and FGD guide. The participants were assured of confidentiality of the information provided. The questionnaire did not bear the names of the respondents nor markers linked to individual participants. The data was stored in a password protected computer.

FINDINGS

Demographic and Socio Economic Characteristics of Respondents

The study collected information on the socio-demographic and socio economic characteristics of respondents. Findings in Table 1 show that majority (65.2%) of the participants in the study were male. The findings also show that the mean age of participants was 34 years. Majority (71.9%) of the respondents were married. On religion, a significant number (93.3%) of participants were Christians (Table-1).

The study also assessed participants' occupation and monthly income. The findings showed that 48.1% were self-employed majority (87.2%) had an income of less than KES 10,000. The mean monthly income was KES 7,014(Table-2).

Table-1: Demographic Characteristics of TB Patients

Characteristic	Category	N(135)	
		N	%
Gender	Male	88	65.2
	Female	47	34.8
Age	<21	13	9.6
	21-30	46	34.1
	31-40	36	26.7
	41-50	27	20.0
	51-60	10	7.4
	>60	3	2.2
	Mean age	34.19±11.568	
Marital status	Single	36	26.7
	Married	97	71.9
	Separated	2	1.5
Religion	Christian	126	93.3
	Islam	9	6.7
	Total	135	100

Table-2: Socio-Economic Characteristics of TB Patients

Characteristic	Category	N(135)	
		N	%
Occupation	Business	65	48.1
	Employed	23	17.0
	Casual	10	7.4
	Farmer	18	13.3
	Unemployed	19	14.1
Monthly Income (KES)	<10,000	102	87.2
	10,001 – 20,000	9	7.7
	20,001 – 30,000	3	2.6
	>30,000	3	2.6

Dietary Practices among TB Patients

Findings in Table 3 show that 81% of the respondents had 3 meals per day. The mean value of 3.12 indicates that majority of respondents had an average of 3 meals per day. A standard deviation value of 0.783 is small indicating convergence of responses indicating that a big number of participants consumed between 1 and 3 meals per day.

Table-3: Number of meals Per day of TB Patients

Number of meals	N (135)	%
1-3	109	81
4-6	26	19
Mean	3.12±0.783	

Majority (63%) of respondents indicated that they bought their food as shown in Figure 2 while 36% consumed their own produce.

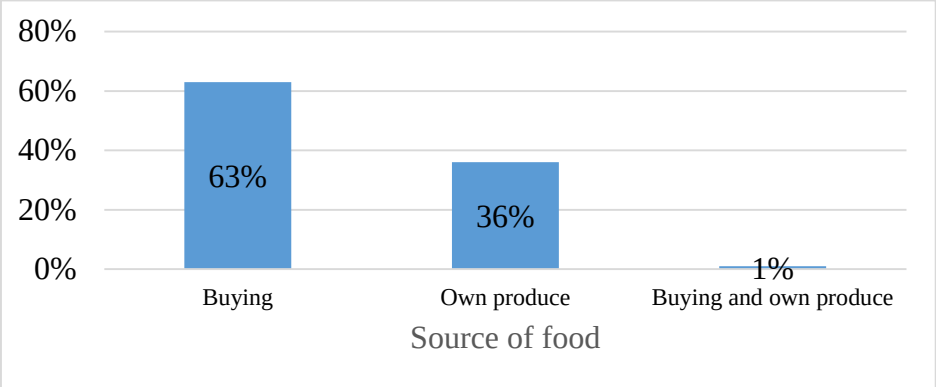

Fig-2: Sources of Food among TB Patients

Majority (75.6%) of participants consumed cereals daily. A share of 36.3% of the participants consumed roots and tubers twice a week. Vegetables were consumed daily and more than 3 times in a week by 42.2% and 46.7% respectively. Just under half (47.4%) of participants consumed fruits once a week. Meat, poultry and offal's were consumed once a week by 40%. Under half 48.9% never consumed eggs. Majority (88.9%) of participants never consumed fish and sea food. About 64.4% consumed pulses, legumes and nuts more than 3 times in a week. Milk and milk products were consumed daily by 46.7% and more than 3 times in a week by 33.3%. Majority (88.9%) consumed oils and fats daily. 62.2% also consumed sugar and honey daily.

Table-4: Frequency of Consumption of Selected Food Groups

	Daily	>3x	2x	Once	Not consumed
	%	%	%	%	%
Cereals	75.6	20	3.7	0.7	0
Roots & tubers	8.9	18.5	36.3	22.2	14.1
Vegetables	42.2	46.7	6.7	1.5	3.0
Fruits	13.3	3.7	20.7	47.4	14.8
Meat, poultry & offals	3.7	14.1	20.7	40.0	21.5
Eggs	2.2	4.4	8.1	36.3	48.9
Fish & sea food	0.7	0.7	0.7	8.9	88.9
Pulses, legumes & nuts	22.2	64.4	8.9	1.5	3.0
Milk & milk products	46.7	33.3	13.3	3.7	3.0
Oils & fats	88.9	8.9	1.5		0.7
Sugar & honey	62.2	14.1	4.4		2.2

A focus group discussion was conducted to collect information on dietary practices The major findings are presented in Table 5. The findings indicate that majority of respondents bought their food. Their TB condition affected their ability to work and feed properly due to weakness and side effects of the drugs. The major side effects experienced were diarrhea and vomiting. The problem of feeding was also confounded by the lack of money to buy food. In addition, at the time of the study the patients were not provided with supplements because they were out of stock.

Table-5: Summary of the main Findings from FGD

Main area of focus for FGD	Major finding
Sources of food in the household	Buying
How TB affects daily activity	Not able to work due to general weakness Not able to feed properly due to side effects of medication
Symptoms experienced in the last 2 weeks	Diarrhea, lack of appetite and vomiting
How TB affects dietary intake	Nausea
Side effects experienced from TB drugs	Vomiting, nausea, lack of appetite and stomach upsets
How taking of food is affected by TB drugs	Loss of appetite
Whether patient skipped meal in last 7 days	Yes due to lack of money
Whether patients were on food supplementation	No. The supplements were out of stock at the time
Whether they experienced changes in weight from the time they got TB	Majority reported that they lost between 5 and 10 kg

Nutrition Status of Respondents

The study sought to assess the nutrition status of respondents. Body mass index was used to assess the nutrition status of respondents. The findings show that 48.1% of the respondents were underweight while 45.9% were normal and 3.7% were overweight.

Table 6: BMI of TB Patients

	N(135)	%
Underweight (<18.5)	65	48.1
Normal (18 -24.9)	62	45.9
Over Weight (25-29.9)	5	3.7
Obese (>30)	3	2.2

Relationship between Demographic and Socio- Economic Characteristics and Nutrition Status of TB patients

To establish the relationship between demographic and socio-economic characteristics and nutrition status of TB patients, chi-square tests were performed. Findings in Table 4.7 show that there was a significant relationship (p=0.012) between gender and nutrition status, there was a significant relationship (p=0.046) between age and nutrition status. The findings also show that monthly income and nutrition status had a significant relationship (p=0.036).

Table 7: Chi-square tests between Demographic and Socio- Economic Characteristics and Nutrition Status of TB patients

Variables	$\chi 2$	df	P value
Nutrition Status versus.			
Gender	10.917	3	0.012*
Age Category	25.273	15	0.046*
Level of education	7.349	12	0.834
Marital Status	3.020	6	0.806
Occupation	9.911	15	0.825
Monthly Income	15.584	9	0.036*
Household Size	6.854	8	0.552

The study rejects the first hypothesis and concludes that there is a significant relationship between demographic characteristics (gender, age and income) and nutrition status among adult pulmonary TB patients attending Nyeri County Referral Hospital.

Relationship between Dietary Practices and Nutrition Status

The study sought to establish the relationship between dietary practices and nutrition status. To achieve this, meals per day were correlated to nutrition status as indicated by BMI at 95% CI. The findings show that that there was a weak positive correlation (r=0.173, p=0.045) between dietary practices and nutrition status of TB patients. The findings suggest that the more the number of meals the more the BMI increases. There is therefore a positive association between dietary practices and nutrition status. The study therefore rejects the second hypothesis and concludes that there is no significant relationship between dietary practices (number of meals, macronutrients (carbohydrates, proteins & fats, micronutrients (Vit. A, D, B6, B12, iron & zinc and frequency of consumption) and nutrition status among adult pulmonary TB patients attending Nyeri County Referral Hospital.

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

Discussion

There was a significant relationship between gender and nutrition status and age and nutrition status. This shows that there was a relationship between age and gender and nutrition status of TB patients. Analysis revealed that females had higher BMI as compared to males however, the difference was not significant. This is consistent with WHO [11] who indicated that male TB patients are more likely to be malnourished. It is however inconsistent with Singroul [26] who found that age was not correlated to anthropometric variables and biochemical variables.

There was a weak positive association between monthly income and nutrition status. This therefore shows that there is a relationship between socio-economic status and nutrition status. The findings imply that the higher the income of TB patient the higher their BMI. This may be attributed to the fact that people who earn less are likely to consume an unhealthy diet due to high food prices. This is consistent with Singroul [26] who found that income level was correlated

to Serum Total Protein and Serum Albumin level in the pulmonary tuberculosis patients. This shows that the low nutrition status of TB patients was attributable to their low-income status.

There was a weak positive relationship between dietary practices and nutrition status of TB patients. This may be attributed to patients' delaying seeking medical attention and beginning medication late due to among others poor socio economic status; this way the disease progresses ultimately leading to undernutrition. The findings suggested that the more the number of meals the more the BMI increases. The findings are therefore in agreement with Lombardo *et al.* [27] who found that newly diagnosed patients with tuberculosis have a poorer nutrition status than their tuberculosis-free counterparts. This is also consistent with findings of Bhargava *et al.* [14] which suggested the need for nutritional support during treatment of pulmonary TB. Dargie *et al.* [28] also found that regular nutritional assessment and dietary counselling should be part of the routine care of adult TB patients.

Conclusion

Majority of the participants of the study comprised of youth, married, unemployed men of Christian faith where slightly less than half of the participants were underweight. The study concludes that as whole dietary practices were poor as only two thirds of the respondents consumed three meals in a day. There was low consumption of micronutrients rich foods and high consumption of fats and oils which led to deficiencies in micronutrients such as iron, zinc, selenium and vitamin D which greatly undermined their nutrition status.

Recommendations

The Ministry of Health should conduct more comprehensive awareness campaigns for TB prevention. This will encourage better health seeking behavior in terms of people visiting hospitals earlier for TB diagnosis. This is important in the case of TB because it is a highly infectious disease. Food assistance programs should be sustained by the government in conjunction with non-governmental organizations. Such programs should consistently provide food supplements rich in micronutrients such as iron, zinc and selenium. This will help in mitigating increased vulnerability to food insecurity among TB-affected households. Food assistance should be conditional on treatment adherence during the previous month to enhance adherence to medication and treatment. World Health Organization's recommendations in nutrition supplementation which call for a daily multiple micronutrient supplement should be adhered to.

SUGGESTIONS FOR FURTHER STUDY

A cohort study should be conducted for causal inference. The current study did not assess the outcome of treatment for the participants. Another study should be conducted to assess the relationship between nutrition status and outcome of TB treatment.

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