

**DETERMINANTS OF ADHERENCE TO DIETARY GUIDELINES AMONG  
TYPE 2 DIABETES MELLITUS PATIENTS AT MOI TEACHING AND  
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## ABSTRACT

Diabetes is one of the major non-communicable diseases and an important public health problem not only in Kenya but all over the world. It is estimated that the prevalence of diabetes in Kenya is at 5% among adults. Although the care regimen is complex, patients with good diabetes self-care behaviors can attain excellent glycemic control. It is vital that patients adhere to their stipulated routines to minimize the burden of the disease on the healthcare systems. The objective of this study was to determine the association between socio-economic and demographic factors with adherence to dietary guidelines among Type 2 diabetes mellitus (DM) patients in Moi Teaching and Referral Hospital (MTRH), Eldoret. A cross-sectional study with mixed methods was conducted among 313 Type 2 DM patients at MTRH. Systematic random sampling was used to select the participants, while purposive sampling was used to select 6 key informants and 50 patients who participated in a Focus Group Discussion (FGD). Data were analyzed using descriptive and inferential statistics. Adherence to dietary guidelines was significantly associated with income ( $p < 0.001$ ) and the frequency of attending clinics ( $p = 0.001$ ). Education levels ( $p = 0.634$ ), Occupation ( $p = 0.358$ ) and Age ( $p = 0.737$ ) had no significant association with dietary adherence. Better ways should be explored in enhancing adherence to dietary guidelines for Type 2 DM patients with high income levels. The study findings are useful in informing implementation and evaluation of nutrition strategies for the control and management of Type 2 DM. This includes nutrition counseling and education, which would inform decisions leading to optimal quality care and cost-effectiveness in the management of Type 2DM.

**Key words:** Income, adherence, non adherence, dietary guidelines, Type 2 DM



## INTRODUCTION

Diabetes mellitus (DM) is on the rise globally and is a concern in both developed and developing countries [1]. It is estimated that between 347 and 422 million adults are affected by diabetes around the world and the prevalence is expected to rise to 642 million by 2040 [2]. Type 2 DM has been shown to be the most common form of diabetes in low income countries, more so in sub-Saharan Africa [1, 2, 3]. In Ghana, about 6% of adults have Type 2 DM [4], while in Kenya the nationally adjusted adult prevalence of diabetes was estimated to be 3.5–5% in 2015 and projected to rise to 4.4% in 2035[4]. Moreover, it is estimated that 458,900 (2.0%) people had Type 2 diabetes mellitus in Kenya by 2017 [1]. However, this prevalence might be higher due to high rate of undiagnosed diabetes [5]. In Kenya, WHO estimates that 27% of all deaths are due to NCDs [6].

Kenya recognizes the growing burden of NCDs that challenges the healthcare systems [1]. Poor management and increasing prevalence of diabetic risk factors are critical hindrances to overcoming diabetes in Kenya [7]. This is revealed by many patients presenting with complications, increased hospital admissions, unproductivity and long stay in hospital, thus straining the limited resources in the healthcare system [8]. In addition, the financial strain from diabetes management hinders Kenya's achievement of Sustainable Development Goals (SDGs), (Ensuring healthy lives and promoting well being for all at all ages) and Kenya's Vision 2030 [9].

Diabetes affects Kenya's healthcare system and the wider economy due to loss of productive workforce [10] and high financial burden to non-diabetics [9]. Ensuring patients' adherence to dietary guidelines is important in order to prevent complications. However, adherence to dietary guidelines remains a major challenge in many developing countries[11]. Several factors, which may be patient or healthcare system related continue to deter adherence among diabetic patients [1]. Income has been known to contribute to non-adherence to dietary guidelines among diabetic patients [1]. Diet management is one of the cornerstones of diabetic care. Adherence to recommended dietary guidelines for diabetic patients is critical in achieving optimal metabolic control, as non-adherence is associated with higher glucose and cholesterol levels, which may lead to major health complications [12].

A study in Uganda reported that a patient's socio-economic status was associated with non-adherence with the costs of treatment being an inhibitory factor in adherence [13]. According to WHO [14], socioeconomic status has not always been found to be an independent predictor of adherence to dietary guidelines, in developing countries; low socioeconomic status may put patients in the position of having to choose between competing priorities [15]. Such priorities frequently include demands to direct the limited resources available to meet the needs of other family members, such as children or parents for whom they care for [15]. Other factors reported to have effects on adherence to dietary guidelines include, poverty, illiteracy, low level of education, unemployment, lack of effective social support networks, unstable living conditions, long distance from treatment center, high cost of transport, high cost of medication, changing environmental situations, culture and lay beliefs about illness and treatment,



and family dysfunction [1]. A study done in Ethiopia cited frequency of family gatherings and friends, and eating out as two major barriers for non adherence to dietary guidelines[12]. The same findings were also reported by other studies conducted in India and Botswana [16,17]. Information and data concerning the association of socio-economic factors and adherence to dietary guidelines for Type 2 DM patients in Kenya are scanty. It is, therefore, against this background that this study was conducted to determine the association between socio-economic and demographic factors with adherence to dietary guidelines among Type 2 DM patients at Moi Teaching and Referral Hospital, Eldoret Kenya.

## MATERIALS AND METHODS

This study was conducted at Moi Teaching and Referral Hospital which is the second largest referral hospital in Kenya. A cross-sectional mixed methods design was used for this study. The study population included all Type 2 diabetic patients at MTRH, while the target population was all diabetic patients attending out-patient clinic at MTRH. The total number of diabetes patients at MTRH was 3000 while the total number of patients with Type 2 DM was 1842. The sample size for this study was determined using Fishers formula [18]. The final sample size was 313. Systematic sampling was used to select 313 Type 2 DM patients who were over 18 years of age and consented to participate in the study. There are three diabetic clinic days in a week and, therefore, 30 patients with Type 2 DM over 18 years of age who consented to participate in the study and were selected during each clinic day for a period of one month.

Approximately 90 patients were selected to participate in the study every week. A list of patients attending clinic on specific days was used as the sample frame. On each clinic day, approximately 150 patients were registered; therefore, to get the interval, 150 was divided by 30 to get 5. From the list, every 5<sup>th</sup> patient was selected systematically. This method was applied systematically till 30 subjects were obtained daily. Six key informants (three nutritionists and three nurses) and fifty Type 2DM patients who participated in the 4 Focus Group Discussions were purposively selected for the study. Quantitative data were collected using a semi-structured interviewer-administered questionnaire.

Quantitative data were analyzed using the Statistical Package for the Social Sciences version 20 (IBM SPSS). Frequency distribution and measures of central tendency were used to describe and summarize data. Chi square test was used to show associations between social- demographic status and dietary guidelines ( $p < 0.001$ ). Qualitative data were transcribed, thematically analysed and coded. The codes were further grouped into categories which were then clustered into similar themes. A semi-structured interviewer-administered questionnaire was used to collect quantitative data on factors influencing adherence to dietary guidelines and socio-demographic characteristics among patients with Type 2 DM. This study was approved by the MTRH Institution of Research and Ethics Committee (IREC/2015/50). The respondents' participation was voluntary and respondents were assured of privacy and confidentiality of the information obtained from them. Thus, the interviews were conducted in a private room. Patients' names were not included on the questionnaires; they were also assured that the information they provided would only be used for academic purposes.



## RESULTS AND DISCUSSION

### Socio-Demographic Characteristics of Type 2DM patients

A total of 313 patients with Type 2 DM participated in the study. Majority of the respondents were females (55%) and married (70.0%), while 28.0% were aged 51-60 years and 33 % were farmers. More than half of the respondents earned an income of less than Ksh.10,000 (10 USD) (60%), while only 3% of the respondents earned more than Ksh. 50,000. The respondents who had primary school education were 42%. The study shows that older, married, female persons were most affected by Type 2DM. The findings are similar to those by Bani [19], which showed an increase in prevalence of Type 2 DM with age and marital status. High socio-economic status, assessed by income, education, or occupation, is associated with a wide range of health problems, including cardiovascular disease, hypertension, arthritis, diabetes, and cancer. This contradicts the findings of Vorster [20], which showed that poverty was closely linked with NCDs. A summary of the patients' characteristics is in Table 1.

### Income and dietary adherence

There was a significant association between income and dietary adherence. As shown in Table 2, majority of those who earned Ksh 10,000 and below (n=107, 55.0%) adhered to dietary guidelines. The study findings are supported by WHO [1] and Kalyango *et al.* [13], who found that high socio-economic status contributes to non-adherence of patients to dietary modifications. This could be attributed to lifestyle changes among those with high income, for example frequent consumption of convenience and junk food (unhealthy food that is high in calories from sugar or fat, with little dietary fiber, protein, vitamins and minerals). There has been a shift from traditional food habits to processed and packaged food products [21]. Consumption of these food products results in elevated intake of saturated fat, trans-fatty acids and food preservatives, and reduced intake of dietary fibre, vital nutrients and phytochemicals when compared to basic dietary guidelines [21]. This is contradicted by Ganiyu *et al.* [16], who found that patients with economic limitations have difficulty in purchasing the foods prescribed in the diet. This may be because a patient's income influences adherence to dietary guidelines by determining accessibility to nutritious food. In this study, high income was associated with non-adherence to dietary guidelines.

### Occupation and Dietary Adherence

This study found no significant association between occupation and adherence to dietary guidelines ( $p=0.358$ ). However, non-adherence varied by a patient's occupation (Table 2). Majority of farmers, business people, students and those who were employed reported adhering to dietary guidelines. A study done in Yemen found a significant association between adherence to diet and occupation. Employees [ $P=0.006$ ] and housewives [ $P=0.012$ ] were three times more likely to adhere to the diet compared with the unemployed individuals [22].

### Frequency of Clinic attendance and Dietary Adherence

There was a statistically significant relationship ( $p=0.001$ ) between frequency of attending clinics and adherence to dietary guidelines; the lesser contacts a patient made



with the facility, the better their adherence. The findings showed that those who visited the clinic once in 3 months had a higher chance of adhering to dietary guidelines compared to those who came to the clinic monthly or once in two months.

#### Representative quote:

*“When a clinician stresses about seeing a nutritionist, the patient changes. I realized that they need continued reassessment and advice. The more they continue to come to the clinic; chances are they will adhere to what we tell them. Nutritional assessment needs to be continuous”* – Nutritionist, E.N., 2017.

Stable patients were given a longer return –to –clinic date than the unstable patients. This is based on their AIC test (blood test that reflects the average blood glucose level in the past 3 months). Patients who were given 3 months return date had good adherence to medication and diet with an AIC level below 5.7%.

#### Age and dietary adherence

There was no significant association ( $p=0.737$ ) between age and adherence to dietary guidelines (Table 2). However, non-adherence varied between different age groups, for example, non-adherence was high among patients aged 50 years and above.

A nutritionist’s in-depth interview explained that the younger people followed stipulated guidelines more compared to the older patients, a trend that has been observed in clinic attendance in relation to age [23].

#### Representative quotes:

*“Younger people seem to remember to follow stipulated guidelines compared to the old people. They seem to remember a lot ”*  
(Nutritionist personal communication, Jan 26, 2017, 16:41).

*‘We are becoming old everyday and we forget a lot of things that we are taught, so we need to be reminded all the time’* ( Patient personal communication, Jan 24, 2017, 14:10).

This contradicts the findings of a study on dietary adherence, which found out that participants who were below 50 years of age had a higher chance of being non-adherent to dietary guidelines compared with those aged 50 or above [24].

#### Education and Adherence

There was no association ( $p= 0.634$ ) between education and adherence to dietary guidelines (Table 2). The respondents with primary education were 42% (  $n=130$ ). Better adherence to nutritional guidelines was found to be associated with the less educated groups [25].

A study by Shamsi *et al.* [26] in Bahrain reported no association between the educational level and dietary practice. Findings from previous studies, however, indicate that low level of education leads to inadequate knowledge about diabetes,



which might lead to poor self-care practice [25, 26]. This contradicts the findings of this study as those with primary education had good adherence to dietary guidelines compared to those with secondary, college or university education. According to a study done in four provinces in Kenya, knowledge on DM was found to be essential for individuals and communities to be able to control diabetes [10]. Information and education ensures improvement in knowledge, attitudes and skills of diabetic patients, which leads to better control of the disease and is widely accepted to be an essential part of comprehensive diabetes care [27].

## CONCLUSION

This study established that income level and frequency of clinic attendance had a significant (positive) relationship with adherence to dietary guidelines. Respondents' education, occupation and age had no association with adherence to dietary guidelines. This study recommends the use of innovative ways in enhancing adherence to dietary guidelines for Type 2DM patients. Nutritionists could come up with health information which can be sent through short message services (SMS) to the patients to support in reminding them on dietary guidelines. Further studies should be done to determine the role of ICT based programme in supporting patient adherence to dietary guidelines.

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## LIST OF ABBREVIATIONS

Type 2 DM –Type 2 Diabetes Mellitus

WHO – World Health Organization

ICT- Information Communication Technology

MTRH –Moi Teaching and Referral Hospital



**Table 1: Demographic Characteristics**

Demographic Characteristics	N (%)
<b>Gender</b>	
Female	171 (55)
Male	142 (45)
Total	313 (100)
<b>Marital Status</b>	
Married	219 (70)
Single	48 (15)
Widowed	46 (15)
Total	313 (100)
<b>Age groups</b>	
<30 years	44 (14)
31-40	34(11)
41-50	50 (16)
51-60	88(28)
61-70	65 (21)
>70 years	32 (10)
Total	313 (100)
<b>Occupation</b>	
Farmers	104 (33)
Students	81(26)
Businessmen/women	55 (18)
Employed	55 (18)
Laborers	18 (6)
Total	313 (100)
<b>Average monthly income in Kenya Shillings</b>	
<10,000	187 (60)
10,001 -20,000	64 (20)
20,001-30,000	34 (11)
30,001-40,000	11 (4)
40,001-50,000	7 (2)
>50,000	10 (3)
Total	313 (100)
<b>Education Level</b>	
Primary	130 (42)
Secondary	98 (31)
College	35 (11)
University	20 (6)
None formal education	30 (10)
Total	313 (100)



**Table 2: Association between Socio-Economic variables (income, occupation), Socio-Demographic Variables (clinic attendance, age, level of education) and adherence to diet**

Variable	Adherence to dietary guidelines			P value
	YES N(%)	NO N	Totals(%)	
Income levels (Kshs)				
Below 10,000	107 (55)	88 (45)	195(100)	p<0.001 $\chi^2 = 179.454$ df= 1
10,0001- 20,000	44 (73)	16 (27)	60 (100)	
20,001 - 100,000	49 (87)	7 (13)	56 (100)	
Above 100,000	1 (50)	1 (50)	2 (100)	
Total	201	112	313	
Occupation				
Self employed	139 (90)	20 (10)	159 (100)	p = 0.358 $\chi^2 = 4.371$ df= 4
Public/civil	16(89)	2(11)	18 (100)	
Employed	46 (84)	9(16)	55 (100)	
Unemployed	74 (91)	7(9)	81 (100)	
Total	275	38	313	
Frequency of clinic attendance				
Bi-weekly	18 (78)	5 (22)	23(100)	P<0.001 $\chi^2 = 174.4573$ df= 3
Monthly	67 (87)	11 (14.3)	78 (100)	
Once in two months	31 (82)	7 (18)	38 (100)	
once in 3 months	159 (91)	15 (9)	174 (100)	
Total	275	38	313	
Age				
Below 20 years	11 (92)	1 (8)	12(100)	p = 0.737 $\chi^2 = 54.0891$ df= 4
21-30 years	29 (91)	3 (9)	32 (100)	
31 -40 years	27 (82)	6 (18)	33 (100)	
41-50 years	45 (88)	6 (12)	51 (100)	
Above 50 years	163 (88)	22 (12)	185 (100)	
Total	273	38	313	
Education				
Primary	118 (91)	12 (9)		p = 0.634 $\chi^2 = .413$ df= 4
Secondary	84 (86)	14(14)		
College	29 (83)	6(17)		
University	17(85)	3 (15)		
None formal Education	27 (90)	3 (10)		
Total	275	38		

## REFERENCES

1. **WHO.** "Global report on diabetes." *World Health Organization*. <https://apps.who.int/iris/handle/10665/204871>, 2016; Accessed 22 Jan 2020.
2. **IDF.** "International Diabetes Federation. IDF diabetes atlas. 7th ed. Brussels: International Diabetes Federation; 2015." *IDF*, 2015.
3. **Gill G V, Mbanya JC, Ramaiya K L and S Tesfaye A** sub-Saharan African Perspective of Diabetes. *Diabetologia*, 2009; **52(1)**: 8–16.
4. **El-busaidy H, Dawood M, Kasay A, Mwamlole C, Koraya N and H Parpia** How Serious is the Impact of Type II Diabetes in Rural Kenya. Retrieved from <http://erepository.uonbi.ac.ke/handle/11295/72263>, 2014; Accessed 11 Oct 2020.
5. **Mohamed SF, Mwangi M, Mutua MK, Kibachio J, Hussein A, Ndegwa Z, Owondo S, Asiki G and C Kyobutungi** Prevalence and factors associated with pre-diabetes and diabetes mellitus in Kenya: results from a national survey. *BMC Public Health*, 2018; **18(3)**: 1215.
6. **Werfalli M, Musekiwa A, Engel ME, Ross I, Kengne AP and NS Levitt** The prevalence of Type 2 diabetes mellitus among older people in Africa: A systematic review study protocol. *BMJ open*, 2014; **4(6)**: 004747.
7. **Musee CN, Omondi DO and W Odiwuor** Dietary Adherence Pattern in the Context of Type 2 Diabetic Management within Clinical Setting, Kenya. *International Journal of Diabetes Research*, 2016; **5(2)**: 26-34.
8. **Mao W, Yip CMW and W Chen** Complications of diabetes in China: Health System and Economic Implications. *BMC public health*, 2019; **19(1)**: 269.
9. **Jones TL** Diabetes Mellitus: the increasing burden of disease in Kenya. *South Sudan Medical Journal*, 2013; **6(3)**: 60-64.
10. **Megeid FYA and MMA El-Sayed** Health education intervention improves knowledge, attitude and practices of mothers of insulin dependent diabetes mellitus. *World Appl Sci J*, 2012; **17(11)**: 1398-1404.
11. **Misra A, Gopalan H, Jayawardena R, Hills AP, Soares M, Reza-Albarrán AA and KL Ramaiya** Diabetes in developing countries. *Journal of Diabetes*, 2019; **11(7)**: 522-539.
12. **Mohammed MA and NT Sharew** Adherence to dietary recommendation and associated factors among diabetic patients in Ethiopian teaching hospitals. *The Pan African Medical Journal*, 2019; **33**.



13. **Kalyango JN, Owino E and AP Nambuya** Non-adherence to diabetes treatment at Mulago Hospital in Uganda: prevalence and associated factors. *African Health Sciences*, 2008; **8(2)**.
14. **WHO**. Diet, nutrition and the prevention of chronic diseases. *World Health Organization Tech Rep Ser*, 2013; **916:(i-viii)**. Retrieved from <http://health.euroafrica.org/books/dietnutritionwho.pdf> Accessed 28 May 2019.
15. **Muruganathan A** *Manual of Hypertension*. JP Medical, 2016. Ltd.
16. **Ganiyu AB, Mabuza LH, Malete NH, Govender I and GA Ogunbanjo** Non-adherence to diet and exercise recommendations amongst patients with Type 2 diabetes mellitus attending Extension II Clinic in Botswana. *African journal of Primary Health Care & Family Medicine*, 2013; **5(1)**.
17. **Parajuli J, Saleh F, Thapa N and L Ali** Factors associated with non-adherence to diet and physical activity among Nepalese Type 2 Diabetes patients; A cross sectional study. *BMC research notes*, 2014; **7(1)**: 758.
18. **Sarmah HK and BB Hazarika** Importance of the size of Sample and its determination in the context of data related to the schools of greater Guwahati. *University Mathematics Association*, 2012; **12**: 55-76.
19. **Bani IA** Prevalence, Knowledge, Attitude and Practices of Diabetes Mellitus among Jazan Population, Kingdom of Saudi Arabia (KSA). *Journal of Diabetes Mellitus*, 2015; **5(2)**: 115.
20. **Vorster HEH** The link between poverty and malnutrition: A South African perspective. *Health SA Gesondheid (Online)*, (2010); **15(1)**: 1-6.
21. **Thuita AW1, Kiage BN1, Onyango AN1 and AO Makokha** Relationship between patient characteristics and glycemic control (hba1c) in Type 2 Diabetes patients attending Thika Level Five Hospital, Kenya . *Afr. J. Food Agric. Nutr. Dev.* 2019; **19(4)**: 115041-15059.
22. **Ramesh R, Kumar SV, Gopinath S, Gavaskar B and G Gandhiji** Diabetic knowledge of rural community and drug utilization pattern in a tertiary care hospital. *Int J Pharm Life Sci*, 2011; **2(1)**: 531-5.
23. **Jepkemoi G, Masibo P and J Laktabai** Aderence to Dietary Guidelines and Dietary Patterns of Type 2 Diabetic Patients in Moi Teaching and Referral Hospital, Kenya.. *International Journal of Advanced Research*, 2018. (IJAR).
24. **Alhariri A, Daud F and SAM Saghir** Factors associated with adherence to diet and exercise among Type 2 Diabetes patients in Yemen. *Diabetes Management*, 2017; **7(3)**: 264-271.

25. **Aggarwal B, Liao M, Allegrante J and L Mosca** Low social support level is associated with non-adherence to diet at 1 year in the family intervention trial for heart health (FIT Heart). *International Journal of Environmental Research and Public Health*, 2010; 380-388.
26. **Lassale C, Galan P, Castetbon K, Péneau S, Méjean C, Hercberg S and E Kesse-Guyot** Differential association between adherence to nutritional recommendations and body weight status across educational levels: a cross-sectional study. *Preventive Medicine*, 2013; **57(5)**: 488-493.
27. **Shamsi N, Shehab Z, AlNahash Z, AlMuhanadi S and F Al-Nasir** Factors influencing dietary practice among Type 2 diabetics. *Bahrain Medical Bulletin*, 2013; **158(749)**: 1-6.

