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Research Article

Compliance to Glycemic Control and Diabetes Dietary Practice among Type 2 Diabetic Patients: Institution Based Cross-Sectional Study

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Abstract

Objectives

Dietary control is regarded as one of the cornerstones of diabetes treatment. The lack of information on dietary habits of diabetes patients undersells the significance of these habits in the management of the condition. Therefore, this study examined the food habits and contributing factors of Type 2 diabetic patients in Hawassa City, Sidama Regional State, Ethiopia.

Keywords: Type 2 diabetic patients;Dietary practice; ethiopia

Introduction

Diabetes mellitus (DM) is one of the commonest non-communicable diseases of the 21st century. The term diabetes mellitus refers to a group of metabolic conditions characterized by abnormality of carbohydrate, fat, and protein metabolism and high blood glucose levels which results from defects in insulin secretion, action, or both [1, 2]. Diabetes mellitus is one of the rapidly increasing non-communicable diseases and an important public health issue all over the world [3, 4]. Recent estimates from the 2013 International Diabetes Federation [IDF] suggest that the number of adults living with diabetes in the world will rise from 382 million in 2013 to 592 million in less than 25 years [5]. The treatment of diabetes should start with non-pharmacological therapies such as lifestyle interventions. A healthy lifestyle with regular physical activity and healthy eating are very important tools in reaching and maintaining adequate glycemic control in patients with type 2 Diabetes [6]. Dietary management is considered to be one of the cornerstones of diabetes care. It is based on the principle of healthy eating in the context of social, cultural and psychological influences on food choices [7]. Good diabetes management is a balance between healthy eating, exercise and medication [8]. Dietary management among Type 2 diabetes patients is one way to prevent or delay the long-term effect of the condition. Diabetic individuals worldwide are routinely advised to adopt a healthful eating behavior, which requires modifications in food habits, beliefs and meal patterns on a lifelong basis [9]. However, despite this effort, Ethiopia is still registering increasing numbers of people being diagnosed with the disease. Dieticians and Nutritionists as well as Health professionals need to be informed on the relationships between psychosocial factors and dietary practice among these patients. This will improve their capacity to manage Type 2 diabetes condition better.Until now, few studies have been reported regarding the association between dietary habits, and glycemic control, mainly focusing on factors associated with dietary practice and barriers to dietary practice among type 2 DM patients. In developing countries like Ethiopia where urbanization is expanding, lifestyles are changing, literacy rate is low, and people are still living in poverty, DM and its impact on development and health is particularly critical.

Methods And Materials

Study setting and design

This study was conducted at the outpatient department of Adare General Hospital in Hawassa City, South Ethiopia. Adare General Hospital is located in Hawassa city, 270 km south of Addis Ababa, Ethiopia, at an average altitude of 1,708 m above sea level. The hospital is selected purposively because of well-organized regular DM case follow-up and large number of type 2 DM case flow-in Diabetic Clinic. The hospital provides a range of services in its outpatient units including follow-up for chronic illness, family planning, maternity services, emergency, inpatient services, surgery, and others services. An institution-based quantitative cross-sectional study was employed. The study population was selected type 2 DM patients attending or visiting outpatients' departments

Sample Size and Sampling Techniques

Sample size was determined using double proportion formula via Epi info 7 software based on a previous study [10]. Despondency was considered as associated factor with exposed proportion of 68.2%, unexposed proportion of 53.2%, odds ratio of 1.8 and 10% non- response rates. Therefore, the final total sample size was 394 DM patients. A systematic sampling technique was employed to recruit the study participant from the selected facilities based on the flow rate during the study period that come for follow-up during a month preceding the data collection.

Data collection tools and Procedure

Data collections were conducted from July 15 to August 15, 2016 by interviewing type 2 adult DM patients using a pretested structured questionnaire. The dietary practice was assessed using the 11item scale which was modified from the eight-item Morisky medication adherence scale (MMAS-8) [11]. Components were computed by taking the mean value to classify the respondents as "good" and "poor". That is, those who scored below the mean value were classified as Good and those who scored above the mean value as poor dietary practices. Dietary diversity of the subjects was assessed using nine food groups; the standard questions were adopted from guidelines for measuring household and individual dietary diversity [12].

Data management and Analysis

The accuracy of the data was verified before being entered into Epi-Info version 7 and exported to SPSS version 20 for additional analysis. The association between the independent factors and dietary practices was examined using bivariate analysis. Logistic regression was applied to test the presence of association. The independent variables (covariates) were selected into the model based on prior evidence in the literature, conceptual framework, and their effect in current analysis. Independent variables with a p-value of 0.25 and less during the bivariate test were then included in the multivariable logistic regression model. Values were then considered statistically significant when p-value is less than 0.05 at 95% CI.

Results

Nearly forty-seven percent (46.8%) of the patients had poor knowledge about diabetes. More than half of the respondents (54.5%) were overweight and obese. The levels of dietary practice among 171 (44.2%) type 2 diabetic patients were poor. Very low monthly income [AOR = 4.87; 95% CI :(1.20-19.81], taking insulin regimen [AOR = 2.36; 95% CI :(1.13–4.91)], taking both insulin injection and oral medication [AOR = 11.26; 95% CI: (3.05–41.54)], not getting DM education in hospital [AOR = 2.72; 95% CI :(1.08–6.85)], despondency [AOR = 3.71; 95% CI:(1.39–9.89), lack of support from family and friends about dietary plan [AOR = 5.64;95% CI (2.66,11.92)], unavailability of fruits and vegetables[AOR = 3.04;95% CI:(1.11–8.34)] were the factors significantly associated with the poor dietary practice.

Socio-Demographic and Economic Characteristics

Out of the total 394 study participants planned, 387 were participated in the study yielding a response rate of 98.2%. Of all` respondents, 180 (46.5%) and 207(53.5%) were female and male, respectively. The majority of the study participants, 288 (74.4%) were in the age group of 35 to 60 years. The mean (± SD) age of the respondents was 51.27 ± 12.03 with the minimum and are married. As for religion of the participants, 197 (50.9%) belonged to Orthodox Christian, followed by Protestant Christian, 153(39.5%). Larger populations were Amhara 134(34.6%) followed by Sidama ethnic group, 105(27.1%). Concerning the educational status of study subjects, a significant number, 298 (77.0%) of the study population had attended formal education and 89 (23.0%) were not able to read and write. Two hundred and sixty-four (68.2%) respondents were unemployed and majority of the study participants 250(64.6%) had very low monthly income (Table 1in the supplementary material).

Characteristic Of Patients According to The Groups of Dietary Practice

The proportions of participants with poor dietary practice were 78 (43.3%) among males and 93(44.9%) among females. The proportion with poor dietary practice was 129(44.8%) among the age group of 35–60, and 32(41.0%) among those who were 61 and above years old (Table 2, 3, 4 in the supplementary material).

Respondents' knowledge about diabetes

Knowledge of the participant about diabetes was measured by using nine variables with 24 possible correct responses. The mean (± SD) knowledge score of study subjects was 11.05(6.20) with a maximum possible score of 24. Two hundred six (53.2%) participants had good knowledge and 181 (46.8%) participants had poor knowledge regarding diabetes. More than half (53.5%) of study subjects didn't know the definition of diabetes. The correct responses on risk factor for diabetes like family history, eating too much fat and sugar, and lack of exercise were 59.9%, 49.1%, 0.3% respectively.

Majority of the study participants 327 (84.5%) and 324(83.7%) considered injection/insulin therapy and orally taken tablets as treatment options, respectively. Passing lots of urine, excessive thirsty, tiredness and weight loss were reported as symptom of poorly controlled DM by 213(55.05%), 167(43.2%), 292(75.5%) and 47(12.1%) respondents respectively. The correct responses on complication of DM like retinopathy, hypoglycemia, nephropathy, and neurologic were 57.9%, 14.5%, 52.5% and 38.2% respectively. Exercise and diet were reported as a life style modification for prevention of DM by 197(50.9%) and 245(63.3%) respondents respectively. However, less than 25.0% of study participants knew weight reduction as life style modification for prevention of diabetes related complications.

Nearly three fourth (69.5%) of study participants knew about the importance of control of blood glucose to reduce complication of DM. Two hundred seventy-eight (71.8%) knew the importance of control of blood pressure for prevention of DM complications. Less than one third (30.7%) of the participants did know about optimum blood sugar level they should be achieve to prevent DM (Table 1).

Variable	Frequency	Percent
What is diabetes?		
DM is a raised blood sugar only	50	12.9
DM is a disease which affects any part of the body	177	45.7
I don't know	157	40.6

Variable	Frequency	Percent
Identify risk factor for DM		
Over eating	121	31.3
Family history	232	59.9
Eating too much fat and sugar	190	49.1
Alcohol	98	25.3
Cigarette smoking	61	15.8
Lack of exercise	1	0.3
No response	63	16.3
Knows treatment options of DM		
Injection/Insulin therapy	327	84.5
Orally taken tablets	324	83.7
Dietary management	194	50.1
Exercise	120	31.0
Don’t know	47	12.1
Knows symptom of poorly controlled DM		
Passing lots of urine	213	55.05
Loss of appetite	71	18.3
Excess thirst	167	43.2
Tiredness	292	75.5
Weight loss	47	12.1
Don’t know	64	16.5
Knows complications of DM, if not treated		
Ophthalmologic	224	57.9
Hypoglycemic	56	14.5
Renal	203	52.5
Neurologic	148	38.2
Don’t know	121	31.3
Know regarding life style modification		
Exercise	197	50.9
Dietary modification	245	63.3
Weight reduction	96	24.8

Variable	Frequency	Percent
Don't know	124	32.0
Control of your blood glucose levels is an important reducing Complication of DM?		
Yes	269	69.5
No	118	30.5
What is optimum blood sugar level you should achieve to prevent DM?		
< 126mg/dl	119	30.7
>=126mg/dl	101	26.1
I don't know	167	43.2
Diabetes patient should measure his or her Blood pressure?		
Yes	278	71.8
No	4	1
Don't know	105	27.1
Knowledge overall score		
Good knowledge	206	53.2
Poor knowledge	181	46.8
With mean knowledge of 11.05 and SD is 6.201 and maximum response is 21 and minimum response is 0 and with possible correct response is 24(9 tools)		

Table 1: Knowledge of participants regarding diabetes mellitus, Adare General Hospital Hawassa City, Ethiopia, Ethiopia, 2016 (n = 387)

Factors Associated with The Dietary Practice of Type 2 Diabetic Patients

An output from a bivariate analysis showed that there are significant associations between dietary practice and various attributes such as: monthly income, occupation, drug regimen, having chronic disease, DM education in hospital, and frequency of DM education. All characteristics with p-value of at most 0.25 in bivariate analysis, such as, knowledge of optimum FBG level, body mass Index (BMI), knowledge about-DM, despondency, lack of support from family and friends, poor understanding on diet disease association, difficulty on availability of fruits and vegetables and price of diet items were entered into the final multivariable logistic regression model to control for potential confounders and significant association at a 5% level of significance was reported.The multivariable logistic regression analysis showed that those who had very low monthly income were 4.87 times more likely to have poor dietary practice than those who had average income (AOR = 4.87; 95% CI: (1.20 -19.81). Subjects who take insulin regimen were 2.36 times more likely to follow poor dietary practice than those who take only oral DM medication (AOR = 2.36; 95%CI: 1.13–4.91) and those who took both insulin injection and oral medication were 11.26 time more likely to follow poor dietary practice than those who take only oral DM medication (AOR = 11.26; 95% CI: (3.05–41.54). With regard to education, those who didn't get DM education were 2.72 times more likely to have poor dietary practice than those who got (AOR = 2.72; 95%CI: (1.08–6.85) and who did get DM education for less than 2 times were 5.88 times more likely to follow poor dietary practice compared to those who got dietary education twice or more (AOR = 5.88; 95% CI: 1.88–18.88). Respondents who had despondency were 3.71 times more likely to follow poor dietary practice than those who did not have despondency (AOR = 3.71; 95% CI: (1.39–9.89) (Table 2).

Respondents who had lack of support from family and friends were 5.64 time more likely to follow poor dietary practice than those who had support (AOR = 5.64; 95% CI: 2.66–11.92). Likewise, patients who had less access to fruits and vegetables were 3.04 times more likely to have poor dietary practice than those who did not (AOR = 3.04; 95% CI: 1.11–8.34) (Table 3).

Variables	Dietary practice		COR (95% CI)	AOR (95% CI)
	Poor	Good		
Monthly Income				

Variables	Dietary practice		COR (95% CI)	AOR (95% CI)
	Poor	Good		
Very low Low Average Above Average	135(54.0%) 10(34.5%) 10(27.8%) 16(22.2%)	115(46.0%) 19(65.5%) 26(72.2%) 56(77.8%)	4.11(2.24–7.55) * 1.84(0.72–4.74) 1.35(0.54–3.37) 1	4.87(1.20-19.81) ** 1.32(0.27–6.43) 1.05(0.27-4.00) 1
Occupation				
Employed Unemployed Merchant	34(33.3%) 132(50.0%) 5(23.8%)	68(66.7%) 132(50.0%) 16(76.2%)	1 2.00(1.24–3.22) * 0.63(0.21–1.85)	1 0.53(0.14-2.00) 0.39(0.07–2.14)
Drug regimen currently				
Oral DM medication Insulin Insulin & Oral Only Diet plan	92(36.9%) 58(51.3%) 19(82.6%) 2(100%)	157(63.1%) 55(48.7%) 4(17.4%) 0(0.0%)	1 1.80(1.14–2.82) * 8.12(2.67–24.5) * 0.00(0.00 -)	1 2.36(1.13–4.91) ** 11.26(3.05–41.54) ** 0.00(0.00 -)
Having Chronic Disease				
Yes No	82(50.9%) 89(39.4%)	79(49.1%) 137(60.6%)	1.60(1.06–2.40) * 1	1.79(0.92–3.50) 1
Ever attended DM Education in Hospital				
Yes No	29(15.6%) 142(70.6%)	157(84.4%) 59(29.4%)	1 13.03(7.91–21.46) *	1 2.72(1.08–6.85) **
Number of DM Education in one year				
=<2 times > 2 times	159(93.0%) 12(7.0%)	91(42.1%) 125(57.9%)	18.20(9.54–34.72) * 1	5.88(1.83–18.88) ** 1
Optimum FBG level should achieve to prevent DM related Complication				
< 126mg/dl >= 126mg/dl	53(44.5%) 12(11.9%)	66(55.5%) 89(88.1%)	1 4.14(2.70–6.36) *	1 2.56(0.99–6.57)
Knowledge for DM				
Good Knowledge Poor Knowledge	68(31.5%) 113(66.1%)	148(68.5%) 58(33.9%)	1 4.24(2.76–6.50) *	1 1.65(0.64–4.25)
Despondency				
Yes No	37(78.7%) 134(39.45)	10(21.3%) 206(60.6%)	5.69(2.74–11.82) ** 1	3.71(1.39–9.89) ** 1

Variables	Dietary practice		COR (95% CI)	AOR (95% CI)
	Poor	Good		
*Statistically associated Variable with; P = < 0.25; NB: P-Value is, Value of COR analysis result				
** Statistically associated Variable with; P = < 0.05; NB: P-Value is, Value of AOR analysis result				

Table 2: Bivariate and Multivariable Logistic Regression Analysis of Factors Associated with Dietary Practice of Type 2 Diabetic Patients in Adare General Hospital Hawassa City, Ethiopia, 2016 (N = 387)

Variables	Dietary practice		COR (95% CI)	AOR (95% CI)
	Poor	Good		
Challenge on food preparation based on DM status				
Yes No	117(42.5%) 54(48.2%)	158(57.5%) 58(51.8%)	0.79(0.51–1.24) 1	
Difficulty on choosing foods				
Yes No	120(43.2%) 51(46.8%)	158(56.8%) 58(53.2%)	0.86(0.55–1.35) 1	
Lack of support of family and friends				
Yes No	92(80.7%) 79(28.9%)	22(19.3%) 194(71.1%)	**10.27(6.02–17.51) *** 1	**5.64(2.66–11.92) **** 1
Poor understanding on food d/s association				
Yes No	79(66.4%) 92(34.3%)	40(33.6%) 176(65.7%)	**3.78(2.39–5.96) *** 1	1.15(0.55–2.40) 1
Do you control DM by food planning?				
Yes No	126(73.7%) 45(26.3%)	180(83.3%) 36(16.7%)	1 **1.79((1.09–2.93) *** 	1 0.75(0.30–1.86)
Difficulty on availability of fruits and vegetables				
Yes No	141(61.0%) 30(19.2%)	90(39.0%) 126(80.8%)	**6.58(4.08–10.61) *** 1	**3.04(1.11–8.34) **** 1
High cost of foods				
Yes No	147(56.5%) 24(18.9%)	113(43.5%) 103(81.1%)	**5.58(3.36–9.27) *** 1	1.03(0.33–3.20)
*Statistically associated Variable with; P < 0.25 NB: P-Value is, Value of COR analysis result				
** Statistically associated Variable with; P < 0.05 NB: P-Value is, Value of AOR analysis result				

Table 3: Bivariate and Multivariable Logistic Regression Analysis of Barriers affecting dietary practice of type 2 diabetic patients in Adare General Hospital Hawassa City, Ethiopia, 2016 (n = 387)

Discussion

Diabetes dietary practice depends on guidance from a health care provider, meal preparation in a family context and exercising with a partner or in a group. The current study showed that nearly half proportion of type 2 DM patients had poor dietary practice. Very low monthly income, drug regimen like insulin only and insulin with oral medication, not getting DM education in hospital, less frequency of DM education in one year, despondency, lack of support of family and friends, and difficulty on availability of fruits and vegetables were the variables identified for having significant associations with poor dietary practice.

The overall occurrence of poor dietary practice among type 2 diabetic patients at Adare General Hospital was found to be 44.2%. Similar study done on dietary practice and associated factors among type 2 DM patients in Yekatit 12 Medical College Hospital, Addis Ababa has indicated that 51.4% of the patients had poor dietary practice [13]. Another study done in Tikur Anbessa Specialized Hospital showed that 79% of the study participants did not adhere to recommended dietary management practices which is higher than the finding of the present study [14]. This variation could be due to difference in sample size, difference in educational background, and the role of current strong association of diabetic patients in the study area. Another study done in Uganda on the factors affecting adherence to nutrition therapy found that the practice of recommended nutrition therapy for 62.9% of the diabetic patients was low, which is higher than the finding of present study [15]. The disparity could be explained by the variation in the settings of the study, difference in the socioeconomic and socio-demographic characteristics, different in study instrument used, number of study participants, study design used as well as difference in the types of foods available in the two nations. Studies done on the assessment of dietary practice among diabetic patients in the United Arab Emirates and Riyadh, Saudi Arabia also reported inadequate dietary practice [16][17].

This study identified that monthly income was one of the factors significantly associated with dietary practice. In this finding, 64.6% of respondents had very low monthly income and were 4.87 times more likely to have poor dietary practice than those who had above average monthly income. This is similar with studies done among adult diabetic patients in Harar and Nekemte Hospitals regarding self-care practices [18] [1]. This, may show that patients relatively in high income category can get healthy foods that are recommended for diabetic patients. This finding is consistent with other study conducted in Malaysia on self-care practices of Malaysian adults with diabetes [19]. In clear terms, those who have low monthly income cannot afford to buy different types of foods to fulfill their daily requirements for maintaining good dietary practice. Therefore, they will be forced to consume only some specific foods without choice and get exposed to poor self-dietary management.

Drug regimen like insulin only and insulin with oral medication were other factors affecting the dietary practice. Possible explanation is that the complexity of treatment and duration of disease may lead patients to frustration not to keep recommended dietary practice since most of the time in type 2 DM patient's insulin and insulin with oral medication are treatment option after long time use of oral medication.

Lack of education about diabetes at hospitals and less frequent DM education per year were associated with the poor dietary practice of the patients. This is consistent with study done on the assessment of dietary practice among diabetic patients in Yekatit 12 Medical College Hospital, Addis Ababa [13]. and study done in South Africa which has identified the need for nutrition education related to diabetes care for optimal diabetes management [20]. This may be due to the fact that those who get nutrition education and who get more frequent nutrition education follow the advices from clinicians and have better knowledge and understanding about the foods suitable for condition of their disease, food guides and prescriptions than those who don't get nutrition education.

Despondency was another factor identified to associate with poor dietary practice. Respondents who had despondency were 3.71 times more likely to follow poor dietary practice than those who did not have despondency. This result is in agreement with reports that showed coexisting despondency in people with diabetes is associated with decreased adherence to dietary management DM [21] [11]. Accordingly, those who were despondency for most of the times were two to three times highly at risk of forgetting and not giving value to food planning and therefore, consume whatever is edible.

Lack of support from family and friends was another factor affecting the dietary practice of diabetic patients. Respondents who had lack of family and friends support were nearly six times more likely to follow poor dietary practice than those who had support. This result is in agreement with the study done in USA on predictors of self-care behaviors in adults with type 2 diabetes [8] [22]. This may be due to lack of awareness and insufficient knowledge about dietary regimen of diabetes among families and friends.

On the other hand, the findings from this study contradict the study conducted in Yekatit 12 Medical College Hospital, Addis Ababa [13]. These researchers, who examined the dietary practice and associated factors among type 2 diabetes, found that social support was not associated with poor dietary practice of diabetes patients. The differences in results between this study and the present study could be due to variation in the settings of the study and difference in socio-demographic characteristics.

Non availability of fruits and vegetables was another factor affecting the dietary practice of diabetic patients. This result is in line with a report on creating healthy food and eating environments in the United States of America [22]. This may be due to the seasonality of fruits and vegetables which make the patients suffer from difficulty to take the recommended type and number of fruits and vegetables, leading to poor dietary practice.

Practical implications of the finding

Compliance to glycemic control and diabetes dietary practice is a major problem in people with diabetes, especially among individuals with or at risk of developing diabetes-related complications. Therefore, addressing the factors examined in this study may possibly enhance dietary practice of Type 2 DM patients. Health intervention programmers, dieticians, nutritionists, educators, health psychologists, physicians, nurses, and other clinicians will find it useful in the creation and utilization of holistic intervention in order to improve diabetes dietary practices of Adare General Hospital population with T2DM.

Conclusions

This study showed that the prevalence of poor dietary practices was forty-four percent among type 2 DM patients. Very low monthly income, Drug regimen like insulin only and insulin with oral medication, Not getting DM education in hospital, low frequency of DM education in one year, Despondency, Lack of support of family and friends, and Difficulty on availability of fruits and vegetables were important factors affecting dietary practice of type 2 diabetic patients. As for recommendation, it is vital to take into consideration the following facts to improve the situation of diabetic patients: Regional Health Bureau and Zonal Health Departments should have to develop health information dissemination programs and strategies that consider the low educational status, occupational background, average low monthly income to improve the awareness of diabetic patients about diabetes, the importance of management of DM with diet and on the essence of social support. Moreover, further programming can be considered with Bureau of Agriculture in collaboration with Health to practice gardening for better access of fruits and vegetables aligned with the Nutrition sensitive agriculture interventions. Finally, further study that can assess the association longitudinally is recommended.

Limitation of the study

Findings of this study should be interpreted within several limitations. The design is a cross-sectional rather than longitudinal; therefore, may not show temporal relationships of potential risk factors with dietary practice. The assessment of dietary practices was based on self-reported dietary habits rather than direct observation. Thus, this may lead to under reporting of socially undesirable responses and recall bias. Using self-reported dietary practice as a measure of the level of practice may introduce social desirability bias.

Abbreviations

BMI:	Body Mass Index
DM:	Diabetes Mellitus
FBG:	Fasting Blood Glucose
IDF:	International Diabetes Federation
IRB:	Institutional Review Board
MMAS:	Morisky medication adherence scale
SD:	Standard Deviation
T2DM:	Type 2 Diabetes Mellitus
WHO:	World Health Organization

Declarations

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Authors Contributions

MGM is principal investigator, designed the study, took part in the data collection, entered & analyzed the data and wrote the manuscript of the current study. DH and MZ did participate in data analysis, and write up. DTD and MTG oversaw and gave comment and suggestion during the manuscript write up. The authors read and approved the final manuscript to be submitted.

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Ethics approval and consent to participate

Approval of the research was given by Institutional Review Board (IRB), College of Health Science and Medicine, Hawassa University. The study was conducted in accordance with the Declaration of Helsinki. Prior to data collection the district administrators were contacted with a description of the study and purposes and consent was taken. The nature of the study was fully explained to the respondent. Written informed consent to participate in the study was obtained from participants. Additionally, written informed consent was obtained from the parents of illiterate participants.

Consent for publications

Not applicable for this section

Competing interests

The authors declare that they have no competing interests.

Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding

Author on reasonable request

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