Association between Nutritional Knowledge and Dietary Compliance among Type 2 Diabetes Mellitus Patients at the Bono Regional Hospital, Sunyani, Ghana

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Abstract: Diet therapy and self-care form an integral component of type 2 diabetes mellitus (T2DM) management, however, little is known about the nutritional knowledge and dietary habit of T2DM patients accessing healthcare at the Bono Regional Hospital in Ghana. This study sought to fill the existing knowledge gap which is critical to addressing the challenges associated with the management of T2DM. A descriptive cross-sectional study was conducted at the Bono Regional Hospital, Sunyani, Ghana. T2DM clients were recruited using systematic sampling. Semi-structured, interview-administered questionnaires were used to collect data for the study. The primary data for the study were analyzed using Statistical Package for Social Sciences (SPSS) version 25. Based on our specified criteria, the majority of respondents (52.1%) demonstrated good nutritional knowledge, however, only 39.3% of them showed good dietary compliance. A Pearson's chi-square test (with Yates' Continuity Correction) showed a statistically significant association between nutritional knowledge and overall dietary compliance, χ^2 (1, n = 140) = 10.23, P = .001, phi = .27. Also, nutritional knowledge was associated with consumption of complex carbohydrates χ^2 (1, n = 140) = 7.43, P = .009, phi = -.23, low-fat diet χ^2 (1, n = 140) = 8.51, P = .005, phi = -.274, and controlled portions of proteins χ^2 (1, n = 140) = 10.67, P = .002, phi = .24. Comprehensive nutritional education, tailored to patients' needs, and socio-cultural and economic situations could help to promote adherence to dietary recommendations among T2DM patients accessing healthcare at the Bono Regional Hospital.

Keywords: Nutritional knowledge; dietary compliance; type 2 diabetes; Bono regional hospital.

1. INTRODUCTION

Diabetes mellitus (DM) is a chronic, metabolic disorder that is characterized by persistently high levels of serum glucose above the normal ranges (WHO, 2021). DM is one of the non-communicable diseases (NCDs) of global public health concern (Annani-Akollor *et al.*, 2019), affecting about 8.8% of the global population (Sheikh *et al.*, 2021). The commonest form of the disease is Type 2 diabetes mellitus (T2DM), which forms about 90% of the global DM cases (Annani-Akollor *et al.*, 2019). For the past three decades, the incidence and prevalence of all forms of DM have increased considerably, from 108 million to 422 million between 1980 and 2014 (Peer *et al.*, 2014). The International Diabetes Federation (IDF) even projects that by 2040, the prevalence of DM could reach 642 million (Sheikh *et al.*, 2021). The largest burden of DM occurs in low-and-middle-income countries (LMICs) (WHO, 2021). Conservative estimates suggest that about 8% of the adult population above 25 years of age in sub-Saharan Africa (SSA) live with T2DM (Whiting *et al.*, 2011). Report from a recent population-based study indicates that between 3.3% and 6% of Ghanaian adults are living with DM (Narh et al., 2021). According to Gatimu *et al.*, (2016), the weighted prevalence of DM among the Ghanaian adult population above 49 years of age was 3.95%. This is projected to reach 820,000 by 2035 (De-Graft *et al.*, 2015).

Several factors have been attributed to the recent observation of the incidence and prevalence of DM in Africa. These include genetic predisposition, social factors such as socio-economic status, race/ethnic background, and the physical environment which affect the consumption and utilization of energy (Aryee, Helegbe *et al.*, 2013). Other socio-political factors such as limited support for health, agriculture, community planning and development, transport, environment, food processing, distribution, marketing, and education policies, and programmes have contributed to the increasing burden of DM globally (Tuoyire *et al.*, 2016). The negative impact of DM on the population spans from huge financial burdens to many health conundrums (Mogre *et al.*, 2015). According to WHO (2021), adults living with DM are at a heightened risk of coronary heart diseases and cerebrovascular accidents (stroke). Between 2000 and 2016, globally, the rate of premature deaths due to DM rose by 5% and about 1.6 million deaths annually are directly attributed to DM (WHO, 2021). Again, worldwide, DM is a leading cause of blindness, renal failures, and amputations of limbs (WHO, 2021).

Treatment options for DM include oral hypoglycemic medications, insulin, diet therapy, and lifestyle modification (Katsaridis *et al.*, 2020). Research has proven that the anthropometric and biomedical markers of T2DM patients who correctly adhered to medical nutrition therapy (MNT) and DM self-management education (DSME) had improvements and this is important to the disease outcomes (Han *et al.*, 2020). The cornerstone of MNT for DM is the consumption of food that has controlled portions of protein (e.g. fish), little fatty acid, omega 3, and is high in fiber products, fruits, vegetables, and low sodium (Sami *et al.*, 2020a). Unfortunately, little is known about the nutritional knowledge and dietary habit of DM patients accessing healthcare at the Bono Regional Hospital in Ghana. This study sought to fill the existing knowledge gap which is critical to addressing the challenges associated with effective management of T2DM.

2. MATERIALS AND METHODS

Study Design and Study Area
A hospital-based, descriptive cross-sectional study design was used for the study at the Bono Regional Hospital in Sunyani. On 11th May 1927, the then British government established the Bono Regional to provide essential medical care to people living in the Western Ashanti, now called Bono (GHS, 2016). Over the years, the population of Sunyani and Bono Region has increased significantly. Alongside, the Hospital has undergone a massive expansion since its establishment to meet the growing needs of its target districts and communities. The hospital

was renovated in 2003, bringing in new ultramodern medical facilities and logistics to provide quality services for the Ghanaian people (GHS, 2016). Services provided at the hospital include general and specialized medical services. The hospital also receives referral cases from both public and private-owned health facilities in the Bono, Bono East, and Ahafo regions (GHS, 2016).

Study Population and Sampling Method

The study population comprised of patients diagnosed with DM type 2 who accessed medical care at the Bono Regional Hospital, Sunyani. The sample size for the study was calculated using Cochran's (1977) formula for cross-sectional studies with the following assumptions; a 95% Confidence Interval (a), 5% absolute precision (D), and a corresponding Z_{1-a} score of 1.96. In a similar study, Breen *et al*., (2015) reported that only 9.7% of the respondents met the daily dietary requirements. Based on the information above, the sample size for the study was estimated to be 134, with a 5% attrition rate. Thus, the total sample size for the study was estimated as 140. A systematic sampling technique was used to recruit respondents for the study. First, a sampling interval (K) was calculated by dividing the average population size at the DM clinic by the desired number of respondents for a day, thus, 35. Following this, the researchers randomly picked a number within the sample frame (which was the starting point of the data collection) and increased that number by K to get the next respondent. This process continued until the desired number of respondents in the day was attained. Inclusion criteria were; patient diagnosed with type 2 DM (and verifiable from patient's folder), accessed healthcare at the Bono Regional Hospital, and was willing to take part in the study voluntarily. A person who met the inclusion criteria but had serious medical or other health-related conditions such as severe pain, distress, or psychiatric problems that could interfere with answering the questionnaire were excluded from the study.

Data Collection Instrument and Procedure

Semi-structured, interview was administered questionnaires were used to collect data for the study. The data collection instrument was adapted from the literature and modified to suit the objectives of this study. The first component of the questionnaire contained only closed-ended questions on respondents' socio-demographic characteristics including sex, age, marital status, educational background, and occupation. The second component assessed data on nutritional knowledge (Mugo, 2018). The level of dietary compliance was obtained using a set of questions adapted from Summary of Diabetes Self-Care Activities (SDSCA) measure (Tan *et al*., 2011) and modified to suit the present study.

Data for the study were collected in August 2021. The exercise took place on selected days for DM review and medication refill at the Bono Regional Hospital. This time frame allowed the researchers to have access to the majority of DM patients. When the respondents had been recruited and informed consent was obtained, the researchers read the questions out and translated them into the local dialect (Ashanti Twi) for respondents who could not read and understand the English language. Responses given by respondents were recorded on the questionnaire against the questions answered. Every question was read two times to ensure that they are well understood by respondents.

Statistical Method and Data Analysis

Following data collection, the primary data were checked for completeness and consistency, coded, and entered into International Business Machine (IBM) Statistical Package for Social Sciences (SPSS) version 25. Data cleansing was performed using simple frequencies. Respondents' demographic data were analyzed and the results were presented in a simple frequency table.

Respondents' nutritional knowledge was evaluated using a set of nine (9) questions. For every question, a list of options was provided for respondents to choose from. Those who

answered correctly in each of the questions earned a mark for each. Those who gave the wrong answer or did not know the right answer for one or more of the questions were scored a zero (0) in those specific questions. The total score for every respondent was calculated and were classified as having 'adequate nutritional knowledge' or 'poor nutritional knowledge' depending on their score. For those who had five (5) or more correct responses, they were graded as having 'good knowledge' while those who had less than five (5) correct scores were graded as having 'poor knowledge' (Mugo, 2018).

A set of nine (9) questions were used to assess respondents' compliance with recommended dietary practices. This comprised of various aspects of dietary recommendations and respondents' dietary practices. Those who answered correctly in each of the questions earned a mark for each. Those who gave the wrong answer or did not know the right answer for one or more of the questions were scored a zero (0) in those specific questions. The total score for every respondent was calculated and the respondents were classified as having 'good dietary compliance' or 'poor dietary compliance' depending on their score. For those who had 5 or more correct responses, they were graded as having 'good dietary compliance' while those who had 4 or more incorrect responses were graded as

having 'poor dietary compliance' (Mugo, 2018). A Pearson's chi-square test was performed to determine the association between nutritional knowledge and dietary compliance. A *P*-value < 0.05 was considered statistically significant.

Ethical Consideration

First, we obtained ethical clearance from the research and ethics review committee of the College of Health, Yamfo. Following this, permission was obtained from the management of Bono Regional Hospital, Sunyani. Prior to the data collection, the research objectives and potential benefits of taking part in the study were explained to the study participants. Thereafter, informed consent was obtained. To ensure confidentiality, study questionnaires were identified with serial numbers.

3. RESULTS

Socio-Demographic Characteristics of Respondents

A total of 140 types 2 DM patients participated in the study. The majority of respondents (98.6%) were above 35 years of age. Females constituted 66.4% of the total respondents. With regards to marital status, more than half of the respondents were married (57.9%). About one-third of the respondents were farmers (36.4%) (Table 1).

**Table 1**. Socio-demographic characteristics of respondents

Variable	Frequency (n)	Percent (%)
Age		
< 35 years	2	1.4
> 35 years	138	98.6
Gender		
Male	47	33.6
Female	93	66.4
Marital status		
Single	27	19.3
Married	81	57.9
Window/widower	18	12.9
Divorced	14	10.0
Education background		

| Variable	Frequency (n)	Percent (%)
Primary or lower	32	22.9
Junior High School	85	60.7
Senior High School	2	1.4
College or Tertiary	21	15.0
Occupation		
Public employment	13	9.3
Private employment	14	23.6
Trader	33	30.7
Farmer	20	36.4

Note. N = 140.

Nutritional Knowledge
Based on our specified criteria, more than half of the respondents (52.1%) showed good nutritional knowledge while 47.9% demonstrated poor nutritional knowledge (Fig. 1).
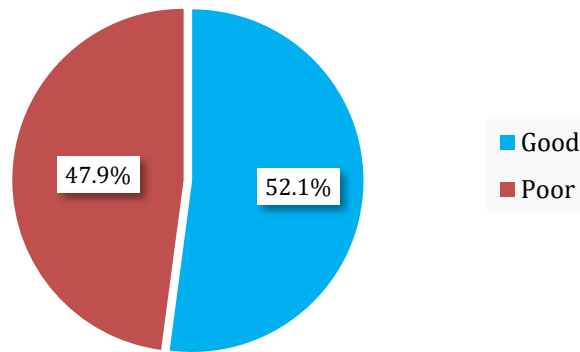
Fig. 1 Pie chart showing the level of nutritional knowledge. N = 140.

Dietary Compliance
Based on our specified criteria, the majority of the respondents (60.7%) demonstrated poor dietary compliance while 39.3% reported good dietary compliance (Fig. 2).
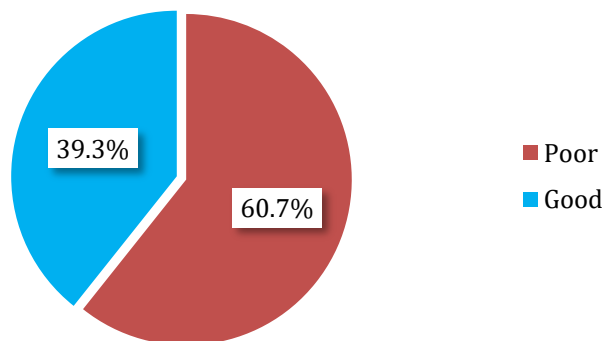
Fig. 2 Pie chart showing the level of dietary compliance. N = 140.

Association between Nutritional Knowledge and Dietary Compliance

Table 2 shows frequencies and chi-square results for nutritional knowledge and dietary compliance. A Pearson's chi-square test (with Yates' Continuity Correction) showed a statistically significant association between nutritional knowledge and overall dietary compliance, χ^2 (1, n = 140) = 10.23, P = .001, phi = .27. The effect size was, however, small according to Cohen's (1992) criteria. The odds ratio (OR) showed that if a respondent had good nutritional knowledge, they were 3.1 times more likely to comply with dietary recommendations than those who had poor nutritional knowledge. Also, nutritional knowledge was associated with consumption of complex carbohydrates χ^2 (1, n = 140) = 7.43, P = .009, phi = -.23, low-fat diet χ^2 (1, n = 140) = 8.51, P = .005, phi = -.274, and controlled portions of proteins χ^2 (1, n = 140) = 10.67, P = .002, phi = .24. The effect sizes were, however, small according to Cohen's (1992) criteria. The odds ratio (OR) showed that if a respondent had good nutritional knowledge, they were more likely to eat complex carbohydrates (OR = 2.5), a low-fat diet (OR = 2.7), and controlled portions of proteins (OR = 3.2) than those who had poor nutritional knowledge.

Table 2. Frequencies and chi-square results for nutritional knowledge and dietary compliance

| Dietary habit | Nutritional knowledge | | | | χ^2 | P-Value |
| | Poor | | Good | | | |
	n	%	n	%		
Overall dietary compliance					10.23	.002*
Poor	50	58.8	35	41.2		
Good	17	30.9	38	69.1		
Individual dietary habits						
Consume complex carbohydrates (e.g. whole meal maize floor) as opposed to refined.					7.43	.009*
Yes	18	33.3	36	66.7		
No	49	57.0	37	43.0		
Consume low-fat diet (e.g. choosing low fat cuts of meat).					8.51	.005*
Yes	17	32.1	36	67.9		
No	50	57.5	37	42.5		
Consume adequate fruits (2-4 portions of fruits a day).					1.01	.350
Yes	16	41.0	23	59.0		
No	51	50.5	50	49.5		
Consume adequate vegetables (3-5 servings of vegetables a day).					4.01	.058
Yes	21	37.5	35	62.5		
No	46	54.8	38	45.2		
Consume controlled portions of proteins (2-3 servings a day).					10.67	.002*
Yes	16	30.2	37	69.8		

Dietary habit	Nutritional knowledge				χ^2	P-Value
	Poor		Good			
	n	%	n	%		
No	51	58.6	36	41.4		
Consume adequate meals a day (minimum of 3).					1.89	.180
Yes	28	41.8	39	58.2		
No	39	53.4	34	46.6		
Observe meal timings.					0.07	.864
Yes	38	46.9	43	53.1		
No	29	49.2	30	50.8		
Carry candy at all times (to eat in case of signs of hypoglycemia).					2.17	.174
Yes	33	42.3	45	57.7		
No	34	54.8	28	45.2		
Drink at least 6-8 glasses of water a day					0.72	.482
Yes	45	50.6	44	60.3		
No	22	43.1	29	56.9		

Note. N = 140. *Significant *p*-value.

4. DISCUSSION

Our study assessed the level of nutritional knowledge of T2DM patients in the context of DM self-care. In a representative sample of T2DM patients drawn from the largest secondary-level hospital in the Bono region of Ghana, we observed that the majority of respondents (52.1%) had good nutritional knowledge, based on our specified criteria. This finding is consistent with those from similar hospital-based studies in Kenya (Mugo, 2018; Caleb, 2020) and Nigeria (Adeleye *et al.*, 2019) where the majority of T2DM patients demonstrated good DM-related nutrition knowledge. The current observation could be explained in part by the recently growing pattern of nutrition-related education in the media and hospital settings, including DM clinics, as access to DM-related nutrition education can influence individuals' level of nutrition knowledge. An implication of this finding is the possibility that most of our respondents would adhere to good dietary practices since studies have shown that good nutritional knowledge can improve food

selection (Sami *et al.*, 2020b) and dietary practices in patients with T2DM (Han *et al.*, 2020). It is important, however, to improve DM-related nutrition and self-care education in communities and primary healthcare centers where the majority of the Ghanaian population first access healthcare.

Contrary to our expectations, the majority of T2DM patients (60.7%) in our study reported poor dietary compliance despite good nutritional knowledge. This is consistent with those from similar single-site studies in Komotini, Greece (Katsaridis *et al.*, 2020), Eastern Ethiopia (Mohammed *et al.*, 2020), Kampala, Uganda (Davidsson & Fahlén, 2016), Kathmandu, Nepal (Kafle *et al.*, 2018), northwest Ethiopia (Ayele *et al.*, 2018), and Kelantan, Malaysia (Tan *et al.*, 2011) where 58.8%, 62.5%, 53.3%, 91.2%, 74.3%, and 83.6% of T2DM patients, respectively were non-adherent to dietary recommendation provided by their dieticians. A possible explanation for the poor dietary compliance despite good nutritional knowledge is the fact that several factors other than nutritional

knowledge influence individuals' food selection and dietary habits, including psycho-socioeconomic factors such as work-related barriers, community-level, and organizational barriers, personal challenges, and other factors (Shamsi *et al.*, 2013) patients' adherence to recommended dietary practices, it is important that nutritionists and dieticians adopt dietary interventions tailored to patient's readiness to change, employing relevant behavioural change communication skills such as Transtheoretical Model (Tan *et al.*, 2011).

Our analysis showed a significant association between nutritional knowledge and overall dietary compliance, although the effect size was small. The odds ratio suggests that if a respondent had good nutritional knowledge, they were more likely to comply with dietary recommendations than those who had poor nutritional knowledge. Also, nutritional knowledge was associated with the consumption of complex carbohydrates, a low-fat diet, and controlled portions of proteins. The effect sizes were, however, small. The odds ratio indicates that if a respondent had good nutritional knowledge, they were more likely to eat complex carbohydrates, a low-fat diet, and controlled portions of proteins than those who had poor nutritional knowledge. In the general population, a weakly positive relationship exists between nutrition knowledge and dietary intake, with the most frequent association found between higher knowledge and higher fruit/vegetable consumption (Breen *et al.*, 2015). In a study among T2DM patients in Eastern Ethiopia, Mohammed *et al.* (2020) reported that lack of dietary education was a major barrier to the practice of dietary recommendations. The T2DM patients who adhered to dietary recommendations were 3.56 times more likely to have good glycemic control (Mohammed *et al.*, 2020). Therefore, diet therapy should be prioritized at the Bono Regional Hospital DM clinic. Nutrition counseling and diet planning should, however, be tailored to individual's health needs, and socio-cultural and economic situations to help DM patients and their

healthcare providers meet their treatment goals and targets (Sami *et al.*, 2020a).

5. CONCLUSION

Dietary compliance was poor despite good nutritional knowledge. However, there was a significant association between good nutritional knowledge and overall dietary compliance. Therefore, comprehensive nutritional education, tailored to patients' needs, and socio-cultural and economic situations could help to promote adherence to dietary recommendations among T2DM patients accessing healthcare at the Bono Regional Hospital.

6. ACKNOWLEDGEMENT

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