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STUDY TO ASSESS THE AWARENESS LEVEL OF DIABETIC PATIENTS REGARDING SYMPTOMS AND PRECIPITATING FACTORS OF HYPOGLYCEMIA IN A TERTIARY CARE HOSPITAL, GHAZIPUR.

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Abstract-

Introduction-Diabetes Mellitus (DM) is a collection of diverse metabolic disorders and a disease of lifestyle.DMmaylead to numerous acute consequences; hypoglycemia being one of them.Research has indicated that those with low awareness are up to 5times more likely to experience hypoglycemia. Thus, this study was planned to assess the awareness level of diabetic patients regarding symptoms and precipitating factors of hypoglycemia

Material and Method-The present study was a questionnaire based cross-sectional observational study conducted on DM patients after considering inclusion and exclusion criteria. Socio-demographic data was collected and to assess awareness, Clarke's questionnaire was asked to the patients. The answers to each question were totaled up and based on the Clarke 's score, patients were classified as: "Aware", "Unaware", and "Borderline".For all statistical tests, p-value of 0.05 or less was defined as statistically significant.

Result-The mean age of the patients was 40.98±19.92years and majority of the cases (77.98%) showed awareness about hypoglycemia.In present study, association of age, gender, education level, income and source of information with awareness level of hypoglycemia was statistically significant.In our study patients were mainly aware of less intake of food as a precipitating factor and had knowledge of heart problems as complications of hypoglycemia. As far as measures are concerned, patients were mainly aware of timely intake of meals as the main measure to prevent hypoglycemia and consuming glucose water as the main measure to treat hypoglycemia.

Conclusion-The awareness about hypoglycemia in diabetics of present study was fairly good. Patients had good understanding of symptoms, preventive measures, and management of hypoglycemia.However, some gaps were there in their understanding of critical concepts which healthcare professionals should address through routine educational initiatives.

Keywords-Hypoglycemia, awareness, IAH, DM etc.

Introduction-

Diabetes Mellitus (DM) is a collection of diverse metabolic disorders and a disease of lifestyle. DM is one of the most common chronic disorders, affecting 537million adults and 1.52million children and adolescents worldwide.[1]Among those aged 30 and over, 17% had DM, a percentage that is expected to increase with time.[2] Diabetes ranks as the fourth-leading cause of death in the majority of developed nations. It is without a doubt, one of the trickiest diseases of the twenty-first century. It is certainly among the most difficult medical issues of the current time. DM may lead to numerous acute consequences; hypoglycemia being one of them.[3] Kedia N found in his study that the most prevalent causes of severe hypoglycemia were inadequate food intake, physical exertion, incorrect insulin dose calculation, and low hypoglycemia awareness.[4] The incidence of hypoglycemia in DM is not known, and based on the health status, it varies from patient to patient. Nonetheless, diabetics annually suffer from 23episodes of mild to moderate hypoglycemia and a minimum of 1severe hypoglycemia episode.[5] The two primary forms of diabetes are insulin-dependent type I diabetes (T1D) and insulin-independent type II diabetes (T2D).[6] Compared to T2D, hypoglycemia occurs 2-3times more frequently in T1D.

But, people with T2D account for the bulk of hypoglycemic episodes because T2D is more common than T1D.[7]However, percentage of T2D patients, who report hypoglycemia to their healthcare professionals, is just between 43-53%.[8] Research has indicated that those with low awareness are up to 5times more likely to experience moderate and severe hypoglycemia.[9] Limited knowledge of hypoglycemia and its symptoms in diabetics has been reported by many studies. A study in Najran[10] showed 44% diabetics, study in Tamil Nadu[11] reported 40% of diabetics and another study[12] documented, 34% of diabetics participants to have poor understanding of hypoglycemia. Hypoglycemia episodes are frequently caused by patients' failure to recognize their symptoms and ignorance of how to treat them appropriately. These episodes can increase morbidity and mortality and cause multi-organ consequences, particularly in cases of severe hypoglycemia.[13] Undoubtedly, there was a knowledge gap that required filling.[14]

The symptoms of hypoglycemia can vary from neuroglycopenic and neurogenic to seizure, and coma.[15] In order to properly manage the episode and take action to prevent a recurrence, it is crucial that the individuals should be able to spot the onset of the symptoms at an early stage.[12] In light of this, it would be advantageous for DM management to understand the various symptoms and possible preventivemeasures of hypoglycemia.[16] Thus, this study was planned with a purpose to investigate the knowledge about hypoglycemia in diabetics in the tertiary care hospital of Ghazipur, Uttar Pradesh.

Material and Method-

The present study was a cross-sectional observational study conducted on DM patients visiting outpatient department (OPD) of Maharshi Vishvamitra Autonomous State Medical College, Ghazipur, Uttar Pradesh for around 1 year from January 2023 to December 2023. A total of 218 diabetic patients of all age groups and both genders irrespective of duration and treatment of the disease (oral hypoglycemic agents or insulin) were enrolled into the study. A written informed consent was taken from all the subjects and ethical clearance from Institutes ethics committee was obtained. Patients who were pregnant, not willing to participate, and had any psychiatric or severe illness were excluded from the study. Questionnaire based method of data collection was used. The questionnaire had two parts: the first part included socio-demographic data. The second part had Clarke's questionnaire[17], comprising of 8 questions to assess the knowledge of hypoglycemia in patients.The questionnaire was prepared in both Hindi and local language and was distributed to the participants or their caregivers (if patient is <18 years o age) on the day of their hospital

visit.Another person who was expert in both languages translated the questionnaire and then the original English tool was compared with this amended translation.

One to one meeting was done to gather data from the participants. All the data from the patients were collected on the same day and no follow ups visits were required for the study. The participants were provided with all the assistance necessary to complete the questionnaire by the investigator, who then collected forms from them.Further the answers of the questionnaires filled by the participants were tabulated and analyzed. The responses to eight questions of Clarke questionnaire were rated as either reduced awareness (R) or awareness (A). Additionally, the Clarke score for R spans from 0 to 7, with two questions combined to provide a single response. Questionnaires filled by the participants were tabulated and analyzed. The answers to each question were totaled up to determine if a respondent is "aware" (value 0) or "unaware" (value 1).The Clarke score of the participants was classified as: “Aware” or “Normal awareness”, if score was 0-2, “Indeterminant” or “Borderline”, if score was 3and “Unaware” or “Impaired hypoglycemia awareness (IAH)”, if scorewas 4-7. Participants with score of ≥4 were at 6times more risk of having severe hypoglycemia (SH). The analysis of the data was done with SPSS 20. A p-value of 0.05 or less was defined as significant for all statistical tests applied.

Result-

The current study was conducted on 218 DM patients to assess their awareness and knowledge regarding hypoglycemia. As visible from table 1, mean age of patients was 40.98±19.92years. Patients were divided into 4groups based on their age i.e. <18years, 18-40, 40-60 and >60years with 21(9.63%), 75(34.40%), 90(41.28%) and 32(14.68%) patients respectively. Our study reported female dominance with 148(67.89%) females and 70(32.11%) males. Maximum number of the patients visiting the hospital had education level of ≥graduate with 80(36.69%) cases followed by secondary schooling, illiterate and primary schooling with 59(27.06%), 54(24.77%) and 25(11.46%) patients respectively. As per modified BG Prasad classification, 37(16.97%) patients belonged to class I, 32(14.68%) patients were in class II and 48(22.01%) patients were in class III. Class IV and V consisted of 24(11.01%) and 77(35.32%) patents respectively. Further source of information regarding hypoglycemia was assessed and multiple responses were allowed to the patients. It was observed that maximum of the patients came to know about hypoglycemia from the doctor or any medical staff (119, 54.58%) followed by the information from a relative or friend or parents (39, 17.89%). Maximum of the patients i.e. 109(50.00%) in our study were suffering with diabetes from last 5-10years. 76(34.86%) patients had diabetes from more than 10years and rest 33(15.14%) had the disease from less than 5years.

Table 1- Distribution of the patients based on the study variables.

Study variable		**n(%)**
Age (Mean±SD)40.98±19.92years	<18years	21(9.63%)
	18-40years	75(34.40%)
	41-60years	90(41.28%)
	>60years	32(14.68%)
Gender	Male	70(32.11%)
	Female	148(67.89%)
Literacy level	Illiterate	54(24.77%)
	Primary schooling	25(11.46%)
	Secondary schooling	59(27.06%)
	Graduate and above	80(36.69%)
Socio-economic status (Modified B G Prasad’s classification for May 2022)	I (≥Rs 8480)	37(16.97%)
	II (Rs 4240-8479)	32(14.68%)
	III (Rs 2544-4239)	48(22.01%)
	IV (Rs 1272-2543)	24(11.01%)
	V (Below Rs 1272)	77(35.32%)
Source of information	Doctor/Medical staff	119

(multiple response were allowed)		(54.58%)
	Relative/friend/parents	39 (17.89%)
	Social Media	32 (14.68%)
	Others	28(12.84%)
Duration of Diabetes	<5years	33(15.14%)
	5-10years	109(50.00%)
	>10years	76(34.86%)

In present study, knowledge of symptoms of hypoglycemia in DM patients was also evaluated and multiple responses were allowed. Figure 1 clearly depicts that mostparticipants had knowledge ofdizziness followed by extreme hunger, weakness, weight loss, drowsiness, headache, tremors, irritability, sweating, confusion, palpitation, others and seizures as symptoms of hypoglycemia with 174(79.81%), 167(76.60%),163(74.77%), 163(74.77%), 155(71.10%), 102(46.78%), 69(31.65%), 66(30.28%), 55(25.22%), 54(24.77%), 35(16.05%), 21(9.62%) and 19(8.72%) cases respectively.

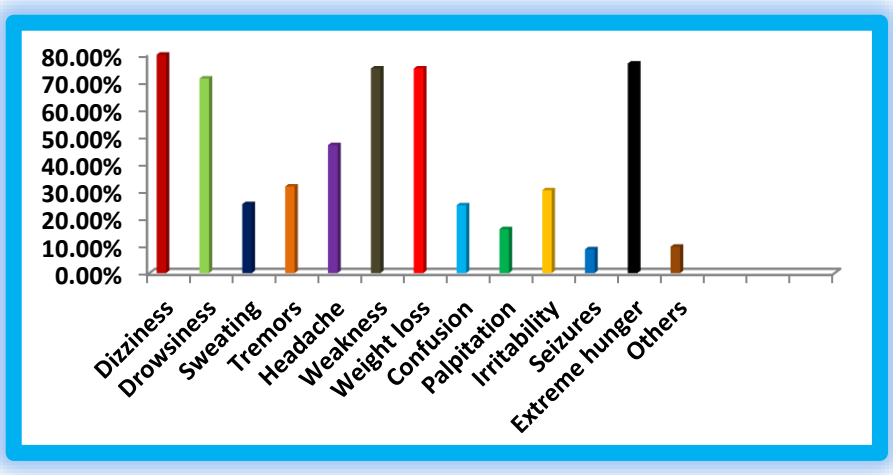

Figure 1- Distribution of patients based on the knowledge of symptoms of hypoglycemia

Based on clarke's questionnaire score, awareness level regarding hypoglycemia of subjects was assessed and was categorized as aware, borderline and unaware/IAH. Figure 2 illustrates that, maximum of the patients of our study i.e. 170(77.98%) were aware of the hypoglycemia. 38(17.43%) were unaware or had IAH and the rest 10(4.59%) cases were on the borderline or were indetermined.

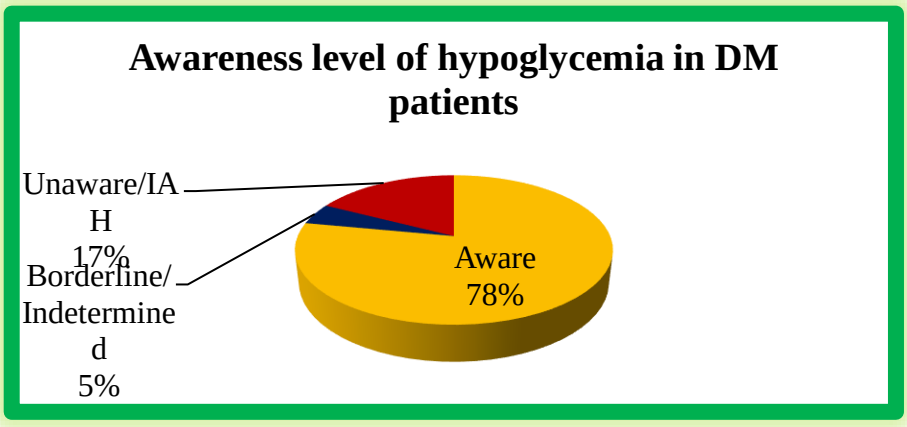

Figure 2- Distribution of patients based on the awareness level of hypoglycemia in DM patients

Table 2 represents the association of awareness level of hypoglycemia in DM patients with the study variables. Awareness of hypoglycemia was maximally seen in age group of 41-60years with 73(42.94%) patients out of total 170 aware patients, followed by 64(37.64%) cases of 18-40years, 20(11.76%) cases of >60yearsand 13(7.64%) cases of <18years. IAH was also mainly observed in age group of 41-60years with 15(39.47%) followed by 10(26.31%),7(18.42%) and 6(15.78%) patients in age group of >60years, <18years and 18-40years respectively. Half of the patients i.e. 5(50.00%) of indetermined or borderline awareness were of 18-40 years. Age group of 41-60years and >60years comprised of 2(20.00%) patients each. The remaining 1(10.00%) patient with borderline awareness was<18years.

Female predominance was observed in all the awareness level i.e. aware, borderline and unaware with 112(65.88%), 8(80.00%) and 28(73.68%) females over the 58(34.11%), 2(20.00%) and 10(26.31%) males respectively. In present study, association of age and gender with awareness level of hypoglycemia was statistically significant. Further in literacy level, it was noticed that aware patients were mainly graduate and above with 80(47.05%) cases followed by secondary, illiterate and primary level of schooling with 45(26.47%), 31(18.23%) and 14(8.23%) patients respectively. Unaware patients were mainly illiterate or had primary or secondary level of schooling with 22(57.89%), 9(23.68%) and 7(18.42%) patients respectively. None of the unaware and borderline awareness patients were graduate and above.

Borderline awareness patients were maximally of secondary schooling with 7(70.00%) cases followed by primary schooling and illiterate with 2(20.00%) and 1(10.00%) subjects respectively. Most of the aware patients were in class V socio-economic scale of BG Prasad classification followed by Class III, Class I, Class II and Class IV with 52(30.58%), 41(24.11%), 37(21.76%), 27(15.88%) and 13(7.64%) patients respectively. Maximum IAH patients were in Class V socio-economic scale 22(57.89%), followed by Class IV, (8, 21.05%), Class III and Class II (4 patients each, 10.52%). Borderline awareness patients were mainly in category of Class III, IV and V (3 patients each).

Only 1 borderline patients was in Class II socio-economic scale. None of the unaware and borderline awareness patients belonged to class I of BG Prasad. As far as source of information regarding hypoglycemia is concerned, it was noticed that maximally aware patients i.e. 115(67.65%) had information from a doctor or any medical staff followed by a relative or friend or parents with 31 (18.23%) cases. 15(8.82%) aware cases had social media and 9(5.29%) had other as information source. Most of the IAH cases had information from other sources followed by social media, relative/friend/parents and doctor or any medical staff with 16(42.10%), 13(34.21%), 6(15.78%) and 3(7.89%) patients respectively. 4(40.00%) borderline cases had hypoglycemia information from social media followed by 3(30.00%), 2(20.00%) and 1(10.00%) cases with other sources, relative/friend/parents and doctor or any medical staff as information source regarding hypoglycemia. In our study, association of education level, socio-economic status and source of information with awareness level of hypoglycemia was statistically significant.

Table 2- Association of awareness level of hypoglycemia in DM patients with study variables.

Study variable		Aware (170)	Borderline (10)	Unaware (38)	p-value
Age	<18years	13(7.64%)	1(10.00%)	7(18.42%)	**0.022**
	18-40years	64(37.64%)	5(50.00%)	6(15.78%)	
	41-60years	73(42.94%)	2(20.00%)	15(39.47%)	
	>60years	20(11.76%)	2(20.00%)	10(26.31%)	
Gender	Male	58(34.11%)	2(20.00%)	10(26.31%)	**0.002**
	Female	112(65.88%)	8(80.00%)	28(73.68%)	
Literacy	Illiterate	31(18.23%)	1(10.00%)	22(57.89%)	**0.000**

Level	Primary schooling	14(8.23%)	2(20.00%)	9(23.68%)	
	Secondary schooling	45(26.47%)	7(70.00%)	7(18.42%)	
	Graduate and above	80(47.05%)	00(0.00%)	00(0.00%)	
Socio-economic status	I (≥Rs 8480)	37(21.76%)	00(0.00%)	00(0.00%)	**0.000**
	II (Rs 4240-8479)	27(15.88%)	1(10.00%)	4(10.52%)	
	III (Rs 2544-4239)	41(24.11%)	3(30.00%)	4(10.52%)	
	IV (Rs 1272-2543)	13(7.64%)	3(30.00%)	8(21.05%)	
	V (Below Rs 1272)	52(30.58%)	3(30.00%)	22(57.89%)	
Source of information	Doctor/Medical staff	115(67.65%)	1(10.00%)	3(7.89%)	**0.000**
	Relative/friend/parents	31(18.23%)	2(20.00%)	6(15.78%)	
	Social Media	15(8.82%)	4(40.00%)	13(34.21%)	
	Others	9(5.29%)	3(30.00%)	16(42.10%)	

Table 3 depicts knowledge of hypoglycemia in DM patients. Questions regarding precipitating factors, complications of hypoglycemia, measures to prevent hypoglycemia and measures to be taken during hypoglycemia were asked and multiple responses were allowed. In our study majority i.e. 149(68.34%) patients were aware of less intake of food as precipitating factor for hypoglycemia.Other factors for hypoglycemia was incorrect dose of medicine or insulin (59, 27.06%), physical exertion 52(23.85%) and alcohol consumption (17, 7.79%). Majority of patients had knowledge of heart problemsas complications of hypoglycemia followed by loss of vision, paralysis, kidney problems, coma and death and lastly fits in 105(48.16%), 79(36.23%), 55(25.225), 33(15.14%), 7(3.21%) and 6(2.75%) patients respectively. Most of the patients i.e. 132(60.55%) in present study were aware of timely intake of meals as the main measure to prevent hypoglycemia followed by other measures like taking prescribed dose of medicine, informing any medical professional incase of low blood glucose and timely self monitoring of blood sugar in 99(45.41%), 67(30.73%) and 35(16.05%) patients respectively.

As far as measures to be taken during hypoglycemia are concerned, consuming glucose powder was noticed to be the main measure in 155(61.92%) cases followed by consuming any drink containing sugar, eatable containing sugar, informing the doctor or visiting the hospital and eating food as the other measures in 126(57.79%), 102(46.785), 89(40.82%) and 79(36.23%) patients respectively.

Table 3- Distribution of DM patients based on the knowledge of hypoglycemia.

Knowledge of Hypoglycemia (multiple response were allowed)		**n (%)**
Aggravating/Precipitating factors	Less intake of food	149(68.34%)
	Physical exertion	52(23.85%)
	Incorrect dose of medicine or insulin	59(27.06%)
	Alcohol consumption	17(7.79%)
Complications of hypoglycemia	Paralysis	55(25.225)
	Heart problems	105(48.16%)
	Kidney problems	33(15.14%)
	Loss of vision	79(36.23%)
	Fits	6(2.75%)
	Coma and Death	7(3.21%)
Measures to prevent hypoglycemia	Timely intake of meals	132(60.55%)
	Take prescribed dose of medicine	99(45.41%)
	Timely self monitoring of blood sugar	35(16.05%)
	Inform any medical professional incase of low blood glucose	67(30.73%)

Measures to be taken during hypoglycemia	Consume glucose powder	155(61.92%)
	Eat food	79(36.23%)
	Consume any eatable containing sugar	102(46.785)
	Consume any drink containing sugar	126(57.79%)
	Inform the doctor or visit the hospital	89(40.82%)

Discussion-

Diabetes has become one of the biggest public health concerns due to its short and long term effects, as its incidence has increased over the past few decades.[18]It is estimated that up to 79.4 million people in India could have diabetes mellitus by 2030.[19] Hypoglycemia is one of the most prevalent issues with diabetes management[20] and achieving ideal blood glucose control is challenging.[21] One of the key variables that significantly raises the occurrence of hypoglycemia is a lack of knowledge about it.[22] So the current study was done to assess the awareness level of diabetic patients regarding symptoms and precipitating factors of hypoglycemia. Our study showed female preponderance (67.89%) with the mean age of the patients as 40.98±19.92years and maximum of them falling into age group of 41-60years. This finding is in disagreement with the study by Sharma et al.[19] as mean age of the subjects in their study was 59.6±9.7years with male and female ratio as 1:1.

The literacy level of majority of patients was graduate and above (36.69%) andmore than 1/3rd of patients belonged to class V of BG Prasad Classification. The reason could be the female dominance in the study and preference of the females of this area to be house makers. The main source of information regarding hypoglycemia of the diabetics of our study was a doctor or a medical staff (54.58%). The possible reason could be the literacy level of the study subjects due to which theywere aware of the fact that a medical person is the right source of information about hypoglycemia. Study by Kalantzi et al.[20] and Al Hussaini H et al.[21] strongly supported our outcome as they also reported most participants of their study got knowledge about hypoglycemia from their doctors.

The half of the patients of our study were diabetics from last 5-10years, which is nearly in harmony with the study by Sharma et al.[19] as they found mean duration of DM to be 10.9±5.9years. In present study, association of age, gender, education level, income and source of information with awareness level of hypoglycemia was statistically significant. These findings are strongly supported by a study which reported poor knowledge of hypoglycemia to be related with older age, illiteracy, and low income.[12] However study by AlTowayan A et al.,[22] did not observe any significant association of poor awareness about hypoglycemia with age, sex and literacy levels. The account for this discrepancy could be the variations in the characteristics of the target population. In current study, most participants had knowledge of dizziness as the symptom of hypoglycemia. This is in harmony with a prior Indian study by Shriraam V et al.[12] and a study in Riyadh, which documented dizziness and weakness as the most common symptoms of hypoglycemia among the diabetics.[23] However, tremors were shown to be the most prevalent sign of hypoglycemia in another study conducted in Al Ahsa.[24] Another study by Al Towayan A et al.,[22] reported weakness as the main symptom. Any symptom of hypoglycemia could appear, and the usual ones don't always appear first.[25]

Therefore, it is imperative that patients are aware of any indicators so they can recognize them early and take appropriate action.In our study patients were aware of less intake of food as precipitating factor and had knowledge of heart problems as complications of hypoglycemia. As far as measures

are concerned, most patients were aware of timely intake of meals as the main measure to prevent hypoglycemia and consuming glucose powder as the main measure taken during hypoglycemia. All these finding of our study are nearly in concordance with the study by Sharma et al.[19] and Shriraam V et al.[12] Patients must be aware about precipitating factors and causes, so that they can take necessary measures to prevent hypoglycemia. All diabetic patients should be aware of the proper way to immediately manage hypoglycemia in order to prevent hospitalization. Patients should also be well informed about the complications of hypoglycemia, as patients would treat this illness more seriously and notify their doctor right away if they had any of the consequences. In present study, majority of the cases (77.98%) showed awareness about hypoglycemia.

This finding is strongly supported by the study of Sharma et al.,[19] as they also indicated that diabetics knew a good deal about hypoglycemia. Another study in Saudi Arabia,[26] and an additional Indian study found that above 60% of the diabetics knew enough about hypoglycemia.[12] Our study's results, however, are in contrast to those of a prior Jeddah study[27] and another study in Turkey[28] that indicated maximum diabetics to have inadequate knowledge of hypoglycemia. In current study, patients with IAH (17.43%) were low. However a study in Malaysia (36.9%)[29] and Brazil (35%)[30] documented higher number and study in UK (8%)[31] found comparatively lower number of diabetics with IAH.Numerous variables can be blamed for this knowledge gap. The grading system, which assigns participants' knowledge a good, fair, or bad grade, is one of the factors. The educational background and information source may also play a role.

Conclusion-

The awareness about hypoglycemia in diabetics of present study was fairly good. The possible reasons for their awareness could be the participants' high degree of education and their dependence on physicians and medical staff as their primary sources of information regarding hypoglycemia. Although IAH was observed in few diabetics but its presence indicates that interventional initiatives are necessary in order to increase public awareness. The diabetics of our study had a good understanding of the symptoms, preventive measures, and management of hypoglycemic attacks; however, some information was deficient and there were gaps in their understanding of critical concepts which healthcare professionals should address through routine educational initiatives.Reiterating health education should be done at extra points of contact as this could be the best way to increase patient knowledge.

Conflict of Interest: None

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