Original Article

Assessing The Knowledge, Attitude And Practice (KAP) of Prediabetes Management Among Healthcare Providers in Four Tertiary Hospitals In Nigeria: An Observational-Based Cross-Sectional Study

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ARTICLE INFO

ABSTRACT

Introduction: An estimated 6.3 million Nigerians were reported to have prediabetes in 2015 placing Nigeria in the 9th position in world ranking. This number is projected to become 12.9 million by 2040. One way of reversing this trend is early identification of individuals at risk. This study was carried out to assess the knowledge, attitudes and practice of health care providers toward prediabetes diagnosis and management. **Methods:** This was an observational-based cross-sectional study involving the use of self administered questionnaire to doctors from the departments of internal medicine, paediatrics, obstetrics and gynaecology, family medicine and others. **Results:** In all, 358 questionnaires out of 410 were selected. All 10 risk factors for prediabetes were correctly identified by 82/358 (22.9%) participants with 300/358 (83.8%) able to identify at least 5 risk factors. Laboratory reference interval of 5.6 – 6.9 mmol/L for diagnosing prediabetes using fasting plasma glucose were correctly identified by 70/358 (19.6%) (lower value) and 14.5% (upper value) respectively. American Diabetes Association guidelines for prediabetes screening was the most familiar to 272(76.0%) respondents even though 144/358(40.2%) do not consider prediabetes as a condition that requires specific management. Over half 186/358(52%) of respondents agreed that metformin use can reduce the risk of diabetes in individuals with prediabetes but only 6/358(1.7%) have ever discussed starting metformin with their patients. **Conclusion:** There is need to educate medical doctors about risk factors for prediabetes and its management to curb the rising diabetes epidemic in Nigeria.

INTRODUCTION

Prediabetes is defined as blood glucose levels above values considered normal but below values accepted as diabetes thresholds. It is a state that puts an individual at a high risk for developing diabetes.(1) There are two states of prediabetes namely: impaired fasting glucose (IFG) and impaired glucose tolerance (IGT). The World Health Organisation (WHO) defines IFG as fasting plasma glucose (FPG) of 6.1 to 6.9 mmol/L (in the absence of IGT). IGT is defined as post load plasma glucose of 7.8 to 11.0 mmol/L two hours after an oral glucose tolerance test (OGTT) provided FPG is <7 mmol/L. (2) The presence of one or a combination of the two defines prediabetes. It is worth noting that the American Diabetes Association (ADA) while applying the same threshold for

IGT as the WHO uses a lower cut-off value for IFG (5.6-6.9 mmol/L) and has additionally introduced haemoglobin A1c levels of 5.7-6.4% (39-47 mmol/mol) as a relatively new category to identify individuals with prediabetes. (3)

About three hundred and eighty million people worldwide are estimated to have IGT translating to 6.7% of adult population. (4) The vast majority of these people live in low- and middle-income countries. By 2040, the number of people with IGT is projected to increase to 482 million or 7.8% of adult population globally. (4) In Nigeria, 6.3 million people were estimated to have prediabetes in 2015 placing Nigeria in 9th position in world ranking. This figure is projected to increase to 12.9 million by 2040. (4) The prevalence of IFG among secondary school students aged 10-19 years in Port

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Harcourt, Nigeria was reported to be 17% and 4% using the International Society for Paediatric and Adolescent Diabetes (ISPAD) and WHO criteria respectively.(5) While in another study involving adults in a rural Nigerian population, the prevalence of IFG was reported to be 9.2% and that of IGT was 15.8%. The overall prevalence of prediabetes (both IFG and IGT) was 21.5%. (6) This is an indication that the problem is common both among children and adults alike in Nigeria.

About 5-10% of people with prediabetes become diabetic annually although conversion rate varies by population characteristics and the definition of prediabetes. (7,8) According to an ADA expert panel, up to 70% of people with prediabetes will eventually go ahead to develop diabetes.(1) Risk factors associated with the development of prediabetes and diabetes includes obesity, overweight, family history, acanthosis nigricans, hypertension, polycystic ovarian syndrome and hyperlipidaemia.(9,10) In addition to possible progression to diabetes from prediabetes, patients with prediabetes stand a risk of complications such as damage to kidney and nerves even at the prediabetic stage including premature death.(1,11) This underscores the need for early identification of prediabetic individuals. There have been several trials which have demonstrated reductions in the risks of developing diabetes among prediabetic individuals after lifestyle and drug based interventions.(12-14) Despite these findings, it has been reported that 90% of prediabetic individuals are unaware of their diagnosis. (15) This may be due to failure on the part of primary care providers (PCPs) to diagnose the condition in apparently healthy clients who may or may not present with risk factors. In view of the untoward consequences of missed or late diagnosis of prediabetes it is important to investigate PCPs practices with regard to diagnosis and managing prediabetes. (16) The focus of this study therefore is to survey PCPs to understand the knowledge gap, practices and challenges regarding prediabetes in a resource-poor setting. It is hoped that this will provide baseline data for designing the approach to early identification of prediabetes with the goal to halt or delay the rising incidence of diabetes and its complications among Nigerians.

METHODS

Ethics

Ethical approval for this research was obtained from the Health Research Ethics Committee of University of Calabar Teaching Hospital (UCTH/HREC/33/493).

Setting

This was an observational-based cross-sectional study involving survey of doctors who are involved in the management of patients with different conditions at four government owned tertiary hospitals in Nigeria. The respondents include newly graduated doctors on mandatory one year internship program (house officers), doctors in the residency training program (resident doctors) and specialist medical doctors (consultants). They were drawn from the departments of internal medicine, paediatrics, family medicine, and obstetrics and gynaecology. Doctors who were not actively involved in running out-patients clinics and those who did not give consent to participate were excluded from the study. The survey instrument was adapted from a questionnaire designed and validated by Tseng et al for a similar study in the United States. (16) The domains were designed based on clinical experience, existing literature and input from practice leaders. A pretest of the questionnaire was conducted among a small group of primary care providers (n=15) by the original designers and the outcome was used to refine the instrument in terms of clarity and interpretability of the questions.

Survey Instrument

The survey instrument was a questionnaire designed to evaluate: 1) knowledge of risk factors that should prompt prediabetes screening, laboratory criteria for diagnosing prediabetes, and guidelines for recommended therapy for prediabetes; 2) management practices around prediabetes; and 3) attitudes and beliefs regarding prediabetes and its management. Guidelines from the American Diabetes Association (ADA) were used in this study to ascertain compliance.

Risk Factors for Prediabetes Screening

This section contained a list of ten potential risk factors and responders were asked to select which ones might prompt them to screen for diabetes. The risk factors are defined by the ADA as those to consider for prediabetes screening among adults who are overweight. (3) Responders were asked to select which guidelines they use for prediabetes screening.

Laboratory Criteria for Diagnosing Prediabetes

Responders were asked to identify the numerical values corresponding to the upper and lower limits of the laboratory criteria for diagnosing prediabetes based on fasting glucose (answer range 70-160 mg/dl in 2 mg/dl increments) and HbA1c (answer range 5-7% in 0.1% increments).

Guideline Recommendations for Treatment of Prediabetes

Responders were asked to circle values corresponding to the ADA recommendations for minimum weight loss (% of body weight) and minimum physical activity (minutes per week) for patients with prediabetes. They were also asked to identify the "best (recommended) initial management approach" to a patient with prediabetes.

Management Practices for Prediabetes

Responders were asked about their use of prediabetes screening tests (non-fasting glucose, fasting glucose, 2 hour oral glucose tolerance test and/or HbA1c), initial management approach including metformin use, and intervals for repeat

laboratory work and follow-up visits. Finally, we assessed whether the ADA guidelines for prediabetes have been helpful for managing patients with prediabetes

Attitudes and Beliefs about Prediabetes and Management of Prediabetes

To evaluate attitudes and beliefs regarding prediabetes, we used a 5-point Likert scale (strongly agree to strongly disagree) to assess whether responders believe that lifestyle modification and metformin can reduce the risk of prediabetes.

Additionally, we used a 5-point Likert scale to evaluate what providers perceived as patient's barriers to lifestyle modification and metformin use. As follow up to the above question we presented several possible interventions for improving the management and treatment of prediabetes and asked responders whether they agreed that those will be helpful.

Primary Care Provider Characteristics

We asked about training (internal medicine, paediatrics, family medicine, obstetrics and gynaecology or general practitioner), status (medical officer, registrar, senior registrar, and consultant), number of years since completing medical school, place of primary medical training (local or foreign), gender and nationality.

Data Collection

The data was collected by administering the questionnaire to doctors present during scheduled departmental and clinical meetings. Participants were required to complete the questionnaire and return to the researchers.

Statistical analysis

Data obtained was entered into Microsoft excel (2007) and analysis of frequency and percentages was done using Excel. Responses were presented as frequencies and percentages. Statistical Package for Social Sciences version 23.0 was used to carry out a bivariate analysis to determine associations between complete knowledge of prediabetes risk factors and socio-demographic characteristics (gender, number of years since training was completed and status) among study participants. They were added simultaneously with a separate model for each outcome. A p-value of <0.05 was accepted as significant. For questions with a Likert scale, we stratified the answers by combining agree and strongly agree versus neutral, disagree and strongly disagree.

RESULTS

General Characteristics of Respondents

There were 410 respondents from the four centres from which 358 (87.3%) completed questionnaires were found to be valid. Fifty-two were rejected due to incomplete informa-

tion provided. Respondents' were drawn from departments of internal medicine (39.7%), paediatrics (6.1%), family medicine (8.9%), obstetrics and gynaecology (25.1%) and others (20.1%). Table 1 summarises socio-demographic characteristics of respondents.

Risk Factors for Prediabetes Screening

All 10 risk factors for prediabetes were correctly identified by 22.9% of respondents with 83.8% able to identify at least 5 risk factors, (Table 2). The most commonly identified risk factor was family history of diabetes in a first degree relative (92.1%) followed by a history of gestational diabetes mellitus (91.0%). The next 3 most selected risk factors include dyslipidaemia (83.1%), hypertension (81.9%) and sedentary lifestyle (74.6%). The least selected risk factors are African race (42.9%) and smoking (41.8%). (Figure 1) Most of the respondents (76.0%) were familiar with the ADA guidelines used for prediabetes screening. The most common screening test employed by respondents was FPG (92.7%) followed by 2 hour oral glucose tolerance test (57%) and haemoglobin (Hb) A1c (56%). About a third of respondents employ non-fasting/random blood glucose (34.1%) while a few (4.5%) do not routinely screen for prediabetes. (Table 2)

Table 1. Demographics of survey respondents

Variable	Frequency	Percentage
Gender: n=358		
Males	228	63.7
Females	130	36.3
Specialty: n= 358		
Internal medicine	142	39.7
Paediatrics	22	6.1
Family medicine	32	8.9
Obstetrics and Gynaecology	90	25.1
Others	72	20.1
Current status n=358		
House officer	108	30.2
Medical officer	62	17.3
Registrar	94	26.3
Senior registrar	72	20.1
Consultant	22	6.1
No of years since completing training: n=356		
<5 years	252	70.8
5-10 years	76	21.3
>10 years	28	7.9
Average number of clinic sessions per week: n = 358		
1-2	294	82.1
3-4	36	10.1
5-6	26	7.3
7-8	2	0.6

Table 2. Reported knowledge, practice, barriers and intervention for prediabetes

Variable	Frequency	Percentage
No. of risk factors correctly identified by respondents: n=358		
None	2	0.6
1	8	2.2
2	8	2.2
3	12	3.6
4	28	7.8
5	52	14.5
6	36	10.1
7	34	9.5
8	52	14.5
9	44	12.3
10	82	22.9
Total	358	100.2
Screening practices of respondents in relation to diabetes: n =358		
Non-fasting blood glucose	122	34.1
Fasting blood glucose	332	92.7
Haemoglobin A1c	200	55.9
2 hour oral glucose tolerance test	204	57.0
Do not routinely screen for prediabetes	16	4.5
Correct identification of prediabetes laboratory diagnostic cut off: n=358		
Lower limit of FPG for diagnosing prediabetes	70	19.6
Upper limit of FPG for diagnosing prediabetes	52	14.5
HbA1c ≥5.7	10	2.8
HbA1c ≤6.4%	26	7.3
HbA1c diagnostic values not known	104	29.1
Minimum body weight loss recommendation of 5%-7%	90	25.1
Minimum physical activity recommendation of 150 min/week	28	7.8
Guidelines used for diabetes screening: n=358		
None	44	12.3
American Diabetes Association	272	76.0
US Task force for preventive services	2	0.6
American Association of Clinical Endocrinologists	12	3.4
Other guidelines	28	7.8

Number that identified at least 5 risk factors correctly = 300 (83.8%)

Laboratory Criteria for Diagnosing Prediabetes

Fasting plasma glucose value of 5.6 mmol/L to 6.9 mmol/L as criteria for diagnosing prediabetes were correctly identified by 19.6% (lower value) and 14.5% (upper value) respectively. Some 51(28.5%) respondents selected values ≥5.6 mmol/L as lower reference FPG values indicating prediabetes. The highest value selected in this category was 7.0 mmol/L with a median of 5.6 mmol/L. One hundred and twenty-four (34.6%) respondents selected values ≥7.0 mmol/l as upper limit for making a diagnosis up to a maximum of 7.8 mmol/L and a median of 6.9 mmol/L. Few knew the ADA diagnostic HbA1c reference values of 5.7% to 6.4% for diagnosing prediabetes with only 2.8% and 7.3% of respondents familiar with the lower and upper reference values of HbA1c respectively. Twenty-nine percent did not know of any values recommended for diagnosing prediabetes using HBA1c. (Table 2).

Guidelines Recommendation for Treatment of Diabetes

Majority of our respondents (76.0%) are familiar with the ADA guidelines for prediabetes screening (Table 3) and 57.5% of them considered it helpful for treatment of prediabetes—Table 4.

Attitudes and Beliefs about Prediabetes and its Management

Over three quarter of respondents (79.9%) agreed that identifying prediabetes in their patients is important for man-

aging their health and determines if they will need to treat co-morbid conditions (86.6%). They also agreed that patients with prediabetes progress faster to diabetes than those with normoglycaemia (81.0%). A good number of respondents (91.6%) agreed that the best initial management approach to prediabetes patients is to provide counselling on diet and changes in physical activity to lose weight. However, only 21.8% of respondents have actually provided such counsel to patients. Although some respondents (40.2%) do
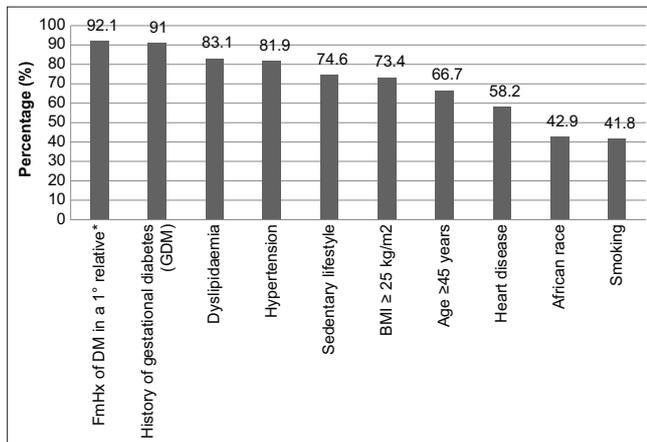

Figure 1. Clinician' knowledge of risk factors that may prompt screening for prediabetes. *FmHx of DM in a 10 relative = Family history of diabetes mellitus in a first degree relative

not consider prediabetes a specific disorder requiring management, others (28.1%) have considered referral of patients to nutritionist. Over half (52%) of respondents agreed that metformin use can reduce the risk of diabetes in individuals with prediabetes but only 1.7% have ever discussed starting metformin with their patients while 25.7% did not believe in prescribing metformin for the condition. Responding to factors that will prompt them to prescribe metformin to patients with prediabetes, 44.7% selected BMI>35 kg/m^2 followed by a family history of diabetes (36.3%) and dyslipidaemia (31.3%). Table 4

The two strongest barriers to achieving lifestyle modification as identified by respondents include a lack of motivation on the part of patients (87.9%) and physical limitation in doing activity (81.6%). Some (62.0%) think that a lack of nutritional resource for patients and financial limitations (62.0%) are significant setbacks that may be compounded by patients' mindset questioning the rationale of these changes (61.5%). –Table 4

The most significant barriers to metformin use identified include poor patient adherence to prescription (85.5%) and cost of medications (70.4%). Other factors like provider's lack of awareness of clinical guidelines (57.5%) and patients dislike to taking medication (54.7%) were also considered as significant.

To improve interventions in prediabetes management providers agreed that there is need to improve access to dia-

Table 3. Management practices around prediabetes (agree and strongly agree)

Variable	Frequency	Percentage
Best initial management approach to patient with prediabetes: n=358		
Provide counseling on diet changes and physical activity to lose weight	328	91.6
Refer patient to a behavioral weight loss program	10	2.8
Discuss starting patient on metformin	4	1.1
No response	16	4.7
Practice given current resources: n=358		
Do not consider prediabetes a specific disorder requiring management	144	40.2
Provide counseling on diet and lifestyle changes	78	21.8
Refer patient to nutritionist	102	28.5
Starting patient on metformin	6	1.7
Refer patient for bariatric surgery	2	0.6
Repeat laboratory test in prediabetes patients: n=358		
3 Months	254	70.9
6 Months	60	16.8
12 Months	18	5.0
No specific recommendation	16	4.5
Others	10	2.8
Return for follow-up: n = 358		
3 Months	234	65.4
6 Months	62	17.3
12 Months	18	5.0
No specific recommendation	18	5.0
Others	26	7.3

Table 4. Attitudes and beliefs regarding prediabetes

Variable	Frequency	Percentage
Identifying prediabetes in my patients (Agree and strongly agree) n=358		
Is important for managing their health	286	79.9
Determines if I need to treat co-morbid conditions	310	86.6
Determines if I need to treat elevated blood sugar	252	78.8
Patients with prediabetes progress faster to diabetes than normoglycaemia	290	81.0
Lifestyle modification can reduce diabetes risk in my patients with prediabetes	332	92.7
Metformin can reduce diabetes risk in patients with prediabetes	186	52.0
Barriers to lifestyle modifications (Agree and strongly agree): n = 358		
Patient lack motivation	314	87.9
Patient physical limitation in doing activity	292	81.6
Lack of weight loss resources for patients	198	55.3
Lack of nutrition resources for patients	222	62.0
Patients do not think it is important to make these changes	220	61.5
Financial limitations	222	62.0
Which of the following will make you prescribe metformin for a patient with prediabetes?: n=358		
I do not believe in prescribing metformin for prediabetes	92	25.7
BMI>35 kg/m^2	160	44.7
Family history of diabetes	130	36.3
Dyslipidaemia	112	31.3
Hypertension	72	20.1
History of GDM	80	22.3
HbA1c > 6%	128	35.8
History of heart disease	46	12.8
Age<60	20	5.6
Age ≥60	78	21.8
Lack of response to lifestyle intervention	136	38.0
Others	0	0.0
Have the ADA guidelines been helpful in managing prediabetes?		
Yes	206	57.5
No, I am not familiar with them	102	28.5
Familiar, but not useful	12	3.4
Unsure	38	10.6
Barriers to metformin use (Agree and strongly agree) n= 358		
Patients do not like taking metformin	196	54.7
Cost of medications	252	70.4
Poor patient adherence	306	85.5
Potential side effects	170	47.5
Provider's lack of awareness of clinical guideline	206	57.5
Lack of FDA approval for use	94	26.3
Other reasons	0	0.0
Effects of interventions to improve management of prediabetes (strongly agree and agree): n=358		
More time for doctors to counsel patients	282	78.8
More educational resource for patients	328	91.6
Improved access to diabetes prevention program	334	93.3
Improved nutrition resource for patients	316	88.3
Improved access to weight loss program	318	88.8
Improved access to bariatric surgery	136	38.0

betes prevention programs (93.3%) and provide more educational resource for patients (91.6%).—Table 4

Table 5 represent correlation between respondents' characteristics and knowledge of risk factors that might prompt one to screen for prediabetes among clinicians. Complete knowledge about prediabetes was defined as ability to identify all 10 risk factors. Complete knowledge about prediabetes risk factors was similar among males and female doctors (p=0.707). Similarly, there was no statistically significant difference between knowledge of these risk factors and respondents' current status (p=0.757), specialty (p=0.315), number of clinics per week (p=0.061 and duration of practice (p=0.615).

DISCUSSION

This survey has revealed that there is very low level of awareness of prediabetes risk factors among doctors in tertiary hospitals in Nigeria. This is probably due to less emphasis on prediabetes during undergraduate and postgraduate medical training. The implication is that many patients with recognizable risk factors for diabetes or prediabetes are

likely to be missed resulting in progression to full blown diabetes mellitus. We are unaware of any previous research on this subject among doctors in Nigeria. However, in a similar survey conducted among primary care providers in the United States reported that only 6% of respondents identified correctly all the risk factors for prediabetes. (16) This suggests that the knowledge gap is more widespread than one would have expected.

A common prediabetes condition is gestational diabetes mellitus (GDM). The condition can be missed during antenatal care visits especially when applying the selective screening approach which is used in most in Africa countries (17) where women without risk factors for GDM are unlikely to be screened. Although this approach is widely preferred in resource poor settings like ours, it may also result in under-diagnosis of the condition among our women. As a consequence, many cases of GDM will be missed resulting in an increase in the burden of diabetes mellitus. Studies have shown that women with GDM have a 70% increased incidence of cardiovascular disease (CVD) compared to their counterparts just within 11 years after the index pregnancy. (18) There has been increased call by some

Table 5. Association between respondents' characteristics and knowledge of risk factors that might prompt clinicians to screen for prediabetes

Variable	Knowledge category			Fisher's Exact Test	P-value
	Complete knowledge n=82	Incomplete knowledge n=276	Total n=358		
Sex: n = 358					
Male = 228	56(24.6)	172(75.4)	228(100.0)	1.286	0.707
Female = 130	26(20.3)	104(79.7)	130(100.0)		
Current status: n=358					
House Officer	21(19.4)	87(80.6)	108(100.0)	1.868	0.757
Medical Officer	17(27.5)	45(72.5)	62(100.0)		
Registrar	20(21.3)	74(78.7)	94(100.0)		
Senior Registrar	18(25.0)	54(75.0)	72(100.0)		
Consultant	6(27.3)	16(72.7)	22(100.0)		
Specialty: n=358					
Internal Medicine	23(16.2)	119(83.8)	142(100.0)	4.623	0.315
Paediatrics	4(18.2)	18(81.8)	22(100.0)		
Family Medicine	11(33.3)	21(66.7)	32(100.0)		
O/G	28(31.1)	62(68.9)	90(100.0)		
Others	16(22.2)	56(77.8)	72(100.0)		
Number of clinic per week: n = 358					
1-2	59(20.1)	235(79.9)	294(100.0)	5.866	0.061
3-4	16(44.4)	20(55.6)	36(100.0)		
5-6	7(28.6)	19(71.4)	26(100.0)		
7-8	0(0.0)	2(100.0)	2(100.0)		
Duration of practice (years): n = 356					
<5	53(21.1)	199(78.9)	252(100.0)	1.088	0.615
5-10	22(28.9)	54(71.1)	76(100,0)		
>10	6(21.4)	22(78.6)	28(100.0)		

Identification of all 10 risk factors for prediabetes was considered as "complete knowledge".

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diabetes groups such as the International Association of Diabetes and Pregnancy Study group (IADPSG) to screen all pregnant women using OGTT irrespective of the presence or absence of risk factors. (19)

Prediabetes screening in the general population using non-invasive screening methods by identifying risk factors such as age, BMI, sedentary lifestyle, family history of diabetes in a first-degree relative is well known and is encouraged. In this survey, even though most doctors identified some risk factors for prediabetes, some did not consider the presence of some of these risk factors as indications for screening. The reason behind this may be that a significant number of respondents did not consider prediabetes as a distinct condition requiring management. In a study conducted among adult subjects aged 18 years and older in Umudike, South-East Nigeria, the prevalence of diabetes mellitus and dysglycaemia were reported as 3.0% and 4.1% respectively. All participants below 46 years with various degrees of dysglycaemia were not previously aware of their glycaemic status (20) meaning they had never been screened before volunteering in the study. This is likely the same situation among many Nigerians and it is a cause for concern especially considering that type 2 DM develops gradually over many years from IFG through IGT and then to overt diabetes mellitus. This finding supports the observation that nine out of ten people with prediabetes are unaware of their status. (15) Another observation from this study was that whereas most of the doctors were aware of the existence of prediabetes, only about a quarter of respondents in this survey regularly provide counselling on diet changes and physical activity to lose weight. Again this may not be unrelated to the perception of most doctors who do not consider prediabetes as a condition requiring management.

It has been shown that lifestyle modification and metformin can delay progression from prediabetes to diabetes compared to placebo by 35% and 40% respectively. (21) In 2003, the ADA guidelines focused on lifestyle modification as a management strategy for individuals with prediabetes after the recommendations two years earlier on the use of metformin as an adjunct to lifestyle modification.(8) Nearly three-quarter of our respondents are familiar with this ADA guidelines for prediabetes and diabetes screening and claim to be using it, but only a quarter of respondents were aware of the specific recommendations for lifestyle modifications (e.g. weight reduction >7% and physical activity >150 min/week) to prevent prediabetes. This suggests that a good number of doctors surveyed may not readily provide adequate counselling to individuals with prediabetes on how to prevent or delay progression to DM. There are evidences that behavioural weight loss programs are very effective at preventing or delaying diabetes onset. (12, 22) In a meta-analysis, it was shown that in people with impaired glucose tolerance, lifestyle interventions seems to be as effective as pharmacologic interventions. (23) In our study however, less than a quarter of respondents admitted to have discussed lifestyle changes with their patients diagnosed with prediabetes and this is in keeping with findings from another study in the United States where only a quarter of patients with prediabetes reported receiving recommendations for lifestyle modification. (24)

About half of our respondents agreed that metformin can reduce risk of diabetes in patients with prediabetes. Despite this, a negligible few have ever discussed its use with patients diagnosed with prediabetes. This is in spite of available published evidence on the benefit of metformin in reversing this condition. (23) A possible reason may be that some physicians may be reluctant to recommend pharmacotherapy for a condition that is largely subclinical and amendable to lifestyle modification. Considering our observations in this study that non-pharmacological interventions such as lifestyle modifications recommendations are still at a very low state, it is unlikely that many doctors will prescribe medications for prediabetes. Possible barriers to implementations of recommendation on the part of patients were identified by respondents to included patient's lack of motivation and physical limitations in doing activity. These factors may contribute to the inertia on the part of PCPs to offer their patients these recommendations. Also to be considered is financial limitations which may play a role in a resource poor setting where health is funded from largely out of pocket. (25) To reduce or eliminate some of these barriers, some have recommended population interventions strategies for low- and middle-income countries for whom individual levels interventions may not be affordable. (26) This will include policy formulation or a voluntary agreement aimed at achieving change in risk exposure. Implementation will involve for example reformation of foods (e.g., to reduce sugar content), provision of adequate information (food labelling) to enable consumers make informed choices and fiscal measures like increased taxes on less healthy food products. Other measures will involve structural adjustment of the environment to encourage active commuting such as safe sidewalks and cycle lanes. (27)

The implementation of some population based interventions outlined above requires higher level of individual engagements for effective results. For example reading and understanding food labels will require literacy on the part of the individual. This may be a problem in a country like Nigeria where the literacy rate is low. Therefore some have advocated for interventions requiring low levels of individual engagements such as regulation of mass media advertisement of foods considered to be unhealthy (28) or food manufacturers reducing the amount of salt (29) or sugar and fortification of general consumer foods with supplements such as vitamin A etc. The aim is to reduce the risk in small amount in a large population rather than targeting high risk group with the aim of reducing risk factors by a large amount among them.(28) There is a need for patients to be adequately educated about diabetes prevention strategies. This will serve as a motivation to achieving the goal of preventing diabetes. Patient education therefore should be taken into consideration when designing interventions. These factors were identified by our respondents as possible barriers to successful interventions.

CONCLUSION

One limitation of this study was the sample size which was relatively small in relation to the number of practitioners in

Nigeria. Notwithstanding, this study has revealed the gap in the knowledge of medical practitioners concerning screening, diagnosing and managing prediabetes. This low level of awareness on the part of doctors mean prediabetes may go undiagnosed in many people leading to the increased incidence of overt diabetes mellitus. Since the emphasis today is on disease prevention rather than cure, we recommend that more efforts be put on educating doctors and other health care providers on the need to be proactive in identifying and treating prediabetes. The screening of all persons who present with at least one risk factor should be adopted as part of routine medical examination or offered generally to adults even without risk factors. Nigerians should be encouraged to visit their PCPs regularly for routine medical check up. More research should be carried out to determine the true prevalence of prediabetes among Nigerians. This will help identify those at risk and preventive measures applied early enough.

ACKNOWLEDGEMENTS

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