SOCIO-ECONOMIC DETERMINANTS OF PATIENTS' AWARENESS OF DIABETIC COMPLICATIONS

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Abstract: Diabetes mellitus (DM) is one of the significant public health challenges facing the human race but, unlike communicable diseases such as malaria, has been largely neglected by stakeholders. A key factor for a successful disease control program is community awareness of its complications and burden/problem. This study examined the influence of diabetic's socio-economic characteristics on awareness of diabetes' complications. A cross sectional survey, approved by Oyo State Health Ministry, was conducted by sampling 51 diabetics in Ring-road and Adeoyo State hospitals in Ibadan, Oyo State, Nigeria. A pre-tested questionnaire was administered to the respondents to obtain relevant data. Descriptive statistics as well as Tobit and bivariate Probit regression models were used for data analysis (at p≤0.05 statistical significance). Data were processed for analysis with Statistical Package for Social Sciences (SPSS) version 16.0 and STATA software. Twenty-four (58.1%) of the participants were diagnosed of DM in 2015 while 51.2% were aware of being diabetic before 2015. Sixteen (38.7%) respectively agreed and strongly agreed that DM can cause health complications with 83.3% of them engaged in the private sector. Education significantly influenced early awareness of diabetes complications by the participant diabetics (β = 0.90, p<0.05) while marital status (β = -0.34, p<0.01) significantly influenced diabetic's believe that DM cause health complications. Participants engaged in the private sector mostly suffered the scourge of DM complications with education and marital status determining their awareness and perception on DM complications. Awareness and education-based campaign targeted at private sector participants should be implemented by relevant stakeholders.

Keywords: Awareness, complication, diabetes, health, non-communicable disease, perception

Introduction

Diabetes (mellitus) is one of the most significant public health challenges facing the human race in the 21st century (WDF, 2007; Mwangi *et al*., 2011; Ullah *et al*., 2015; Premkumar, 2018). Diabetes mellitus (DM) and other similar non-communicable, chronic conditions are taking a huge toll on human health and resources but, until about half a decade ago (Reubi *et al*., 2016), are continuously and largely being neglected by States, individuals and communities (Meetoo, 2008; Mwangi *et al*., 2011; Keast *et al*., 2015; Muhammad *et al*., 2017; Moffatt *et al*., 2019). This is in sharp contrast to the attention accorded communicable diseases such as malaria, HIV, polio, typhoid and yellow fever (Maher and Sridhar, 2012; Luna and Luyckx, 2020). The consequence of this disposition (of neglect) has dire consequences for society in terms of the quality and quantity of human resources. Oguejiofor *et al*. (2014) revealed that DM is a common reason for admission in Nigerian tertiary hospitals with hyperglycemic emergencies and diabetic foot ulceration (DFU) as the commonest indications for admission and DFU notoriously responsible for prolonged hospital stay, morbidity and mortality. Over the years in

Nigeria, this situation has been not been found to improve significantly (Uloko *et al*., 2018; Lawal *et al*., 2019; Udogadi *et al*., 2019).

The prevalence of DM in Africa has risen in the 1950s to 1980s from less than 1.0% to not less than 4.5% in the first decade of the 21st century (Amoah *et al*., 2002; Adeloye *et al*., 2017). Estimates show that about 14 million individuals have DM in Africa with an expected rise to 28 million by the year 2030 (Shigidi *et al*., 2013). In fact, there was a higher (80.0%) prevalence of undiagnosed DM in (Oguejiofor *et al*., 2014). In terms of prevalence statistics, Nigeria with 30 per 1,000 surveyed individuals came third (in 2017) behind Tanzania and Sudan for type 1 diabetes while, with about 1.2million affected people, Nigeria tops in Sub-Saharan Africa (SSA) for type 2 diabetes (Mbanya and Ramiaya, 2006; Adeloye *et al*., 2017). The prevalence rate has been reported to be rising over the years in Nigeria (Enwere *et al*, 2006; Abubakaria and Bhopalb, 2008) but with very wide variation. Owoaje *et al* (1997) reported a prevalence rate of 2.8% in a *Yoruba* community in Ibadan, South-West, Nigeria. Interestingly, Olatubosun *et al* (1998) however reported a rate of 2.2% (a decrease) in the same

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region. Obasohan *et al* (1997) found abnormal glucose tolerance in 36.0% of newly diagnosed hypertensive compared to 1.9 % in normotensive. One in three individual with impaired glucose tolerance (IGT) will develop type 2 diabetes within 10 years if left untreated (O'Sullivan and Mahan, 1968). Bakari and Onyemelukwe (2004) reported an IGT of 7.7% in Northern-Nigeria among *Hausa-Fulani* who had no history of DM. Nwafor and Owhoji (2001) reported 23.0% and 16.0% prevalence for high and low socio-economic class respectively among residence of Port-Harcourt, South-South, Nigeria with 18.9% previously undiagnosed. Also, Chinenye and Young (2011) revealed that the prevalence of DM is higher in urban than rural Nigeria with a prevalence of about 5.0% - 10.0% and 0.0% - 5.0% respectively (Fasanmade and Dagogo-Jack, 2015). Recent studies have, however, shown that over the years in the SSA region (especially Nigeria) there has been no significant change in this scenario (Adeloye *et al*., 2017; Uloko *et al*., 2018; Asmelash and Asmelash, 2019; Jaja and Yarhere, 2019; Lawal *et al*., 2019).

The tendency for a community being actively engaged in health seeking behavior, such as seeking for treatment (Mwangi *et al*., 2011) could lead to acceptance of healthcare intervention program. However, the awareness of the burden/problem of a disease and the efforts to find solution(s) is key for a successful healthcare intervention program to combat any (debilitating) disease (such as DM) in a community (Mubyazi *et al.*, 2013; Hasanov *et al.*, 2017; Wang *et al*., 2019). This (awareness) becomes more pertinent given the fact that DM is reputedly linked to 10.0% to 30.0% reduction in life expectancy mainly due to its associated complications with the propensity for diabetics to die at an earlier age than non-diabetics (Ogbera and Ekpebegh, 2014; Fasanmade and Dagogo-Jack, 2015; Ullah *et al*., 2015; Muschik *et al*., 2017; Adeleke and Ayenigbara, 2019; Salehidoost *et al*., 2020; Tuyen *et al*., 2020).

Diabetics as a group are at increased risk of diseases such as heart ailments, blindness, (due to glaucoma, cataract, and retinopathy), neuropathy, nephropathy, gangrene and (unrecognized) hypoglycemia (Ezenwaka *et al*, 1997; Wright *et al*, 2006; Fowler, 2008; Litwak *et al*., 2013; Cortez *et al*., 2015). All these contribute to the cost of management and to poor quality of life in cases where the blood glucose level is poorly controlled. Citing Chiejina (2009), Ezema *et al*. (2012) pointed out that the potent dangers posed by DM to Nigeria is its prevalence amongst the leaders of Nigeria's economic strength i.e. those between 45 and 64 years of age, though a large number of people between 20 and 44 years were already diagnosed with diabetes. Actually, Fasanmade and Dagogo-Jack (2015) as well as Adeleke and Ayenigbara (2019) asserted that there have been concerns on the increasing trend of DM incidence in Nigerian children and adolescents. This becomes more pertinent given that the median age in Nigeria is estimated by Worldometer (2020) to be 18.1 years. Thus, the question addressed by this study is: do socio-economic characteristics of diabetics have any correlation with their level of awareness of DM complications? Hence, the objective of this study is to examine the influence of diabetic's socio-economic characteristics on awareness of diabetes' complications.

Materials and Method

This study was approved by the Ethics Review Committee of the Department of Planning, Research and Statistics, Oyo State Ministry of Health. The approval (Ref. No. AD 13\479\1445) was given consequent upon compliance with all institutional guidelines, rules and regulations of the National Code for Health Research Ethics.

A cross sectional survey was conducted from June to August 2019 with the sampling of male and female diabetics, under clinical care, in Ring-road and Adeoyo State hospitals in Ibadan, Oyo State, Nigeria. Following Israel (1992), Bartlett *et al*. (2001), Singh and Masuku (2014), Taherdoost (2017); 51 diabetics were sampled from 100 diabetics in the selected healthcare facilities using the published sample size determination table (Table 1). The selected diabetics consented to participating in the study and were interviewed after an explanation on the purpose of the exercise was given.

Table 1: Sample Size Distribution

Size of Population	Sample Size (n) for Precision (e) of:		
	±5%	±7%	±10%
100	81	67	51
125	96	78	56
150	110	86	61
175	122	94	64
200	134	101	67
225	144	107	70
250	154	112	72
275	163	117	74
300	172	121	76
325	180	125	77
350	187	129	78
375	194	132	80
400	201	135	81
425	207	138	82
450	212	140	82

Precision Levels = ±5%, ±7% and ±10%, Confidence Interval = 95% and P = 0.5

Source: Israel (1992), Bartlett *et al*. (2001), Singh and Masuku (2014), Taherdoost (2017)

The diabetics were contacted in their respective hospital of therapeutic care within the study period. Participants with diagnosed diabetes incidence were included while those with ordinary elevated blood glucose were excluded. A pre-tested questionnaire, which took about 20-25 minutes to complete, was administered to the respondents to obtain the relevant data. However, responses from 41 of the 51 completed questionnaires of the sampled diabetics were used for data analysis. The questionnaires of the remaining 10 respondents were discarded due to incomplete/inaccurate responses.

The data were sorted and entered into Statistical Package for Social Sciences (SPSS) version 16.0 for management. Descriptive statistics including frequency and percentage were used to summarize the data while Tobit and bivariate Probit regression models were estimated using SPSS 16 and STATA software in evaluating categorical and binary variables respectively with p≤0.05 considered statistically significant.

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Results and Discussion

Thirty-six (87.1%) of the participant diabetics were more than 60 years of age. Thirty-two (77.4%) had one form of formal education or another and there were more respondents in the private sector (58.1%) than the public sector (41.9%) among the participant diabetics. Also, fewer respondents were ICT users (6.5%) and majority were non-ICT users (93.5%). Furthermore, 58.1% of the participants were diagnosed of DM not more than 5 years and 51.2% were aware of being diabetic less than 5 years before this study. Details are presented in Table 2.

Table 2: Relevant Characteristics and Demographics of Respondents (n = 41)

Characteristic	Awareness of Diabetic Status		
	Less than 5 years	**Greater than 5 years**	**Total**
Age			
31-40	0 (0.0)	1 (6.7)	1 (3.2)
41-50	3 (12.5)	0 0.0)	3 (6.5)
51-60	1 (6.3)	0 (0.0)	1 (3.2)
≥61	17 (81.2)	19 (93.3)	36 (87.1)
Education			
None	8 (37.5)	1 (6.7)	9 (22.6)
Formal	13 (62.5)	19 (93.3)	32 (77.4)
Sex			
Female	11 (52.4)	13 (66.7)	24 (58.1)
Male	10 (47.6)	7 (33.3)	17 (41.9)
Marital status			
No spouse	3 (12.5)	1 (6.7)	4 (9.7)
Married	18 (87.5)	19 (93.3)	37 (90.3)
Occupation			
Private	12 (56.3)	12 (60.0)	24 (58.1)
Public	9 (43.7)	8 (40.0)	17 (41.9)
ICT use			
No	20 (93.7)	18 (90.0)	38 (93.5)
Yes	1 (6.3)	2 (10.0)	3 (6.5)
Place of Diagnosis			
Home	1 (6.3)	0 (0.0)	1 (3.2)
Hospital	20 (93.7)	20 (100.0)	40 (96.8)
Total	**21 (51.2)**	**20 (48.8)**	**41 (100.0)**
Year of Diagnosis			
1-5	24 (58.1)	-	-
6-10	11 (25.8)	-	-
>10	6 (16.1)	-	-
Total	**41 (100.0)**	**-**	**-**

Sixteen (38.7%) respectively agreed and strongly agreed that DM can cause a number of health complications. All (100.0%) of the participants who strongly agreed and 75.0% who agreed that DM can cause a number of health complications were more than 60 years of age. Also, 83.3% of the participants who strongly agreed that DM can cause a number of health complications were engaged in the private sector. Details are presented in Table 3.

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Table 3: Diabetics' Socio-economic Characteristics and Perception of DM Complications

Characteristic	Strongly Disagree	Disagree	Agreed	Strongly Agreed	Total
Age					
31-40	0 (0.0)	0 (0.0)	1 (8.3)	0 (0.0)	1 (3.2)
41-50	0 (0.0)	0 (0.0)	3 (16.7)	0 (0.0)	3 (6.5)
51-60	1 (16.7)	0 (0.0)	0 (0.0)	0 (0.0)	1 (3.2)
≥61	7 (83.3)	1 (100.0)	12 (75.0)	16 (100.0)	36 (87.1)
Education					
None	0 (0.0)	0 (0.0)	5 (33.3)	4 (25.0)	9 (22.6)
Formal	8 (100.0)	1 (100.0)	11 (66.7)	12 (75.0)	32 (77.4)
Sex					
Female	5 (66.7)	1 (100.0)	7 (41.7)	11 (66.7)	24 (58.1)
Male	3 (33.3)	0 (0.0)	9 (58.3)	5 (33.3)	17 (41.9)
Marital status					
No spouse	0 (0.0)	0 (0.0)	1 (8.3)	3 (16.7)	4 (9.7)
Married	8 (100.0)	1 (100.0)	15 (91.7)	13 (83.3)	37 (90.3)
Occupation					
Private	5 (66.7)	0 (0.0)	6 (37.5)	13 (83.3)	24 (58.1)
Public	3 (33.3)	1 (100.0)	10 (62.5)	3 (16.7)	17 (41.9)
ICT use					
No	7 (83.3)	1 (100.0)	14 (87.5)	16 (100.0)	38 (93.5)
Yes	1 (16.7)	0 (0.0)	2 (12.5)	0 (0.0)	3 (6.5)
Diagnosis site					
Home	0 (0.0)	0 (0.0)	0 (0.0)	1 (8.3)	1 (3.2)
Hospital	8 (100.0)	1 (100.0)	16 (100.0)	15 (91.7)	40 (96.8)
Total	**8 (19.4)**	**1 (3.2)**	**16 (38.7)**	**16 (38.7)**	**41 (100.0)**

The factors influencing diabetic's period of awareness of DM complications were assessed with Probit regression model. The pseudo R^2 and log likelihood value indicate that the model is appropriate for the analysis. Education was the only factor that significantly influenced the early awareness of diabetes complications by the participant diabetics (β = 0.90, p<0.05). Details are as presented in Table 4.

Table 4: Determinants of Diabetic's ⬧Period of Awareness of DM complications (n = 41)

Variable	Coefficient	Standard Error	Z	p-Value
Constant	0.5699	1.6246	0.35	0.726
Education	0.8950**	0.3567	2.51	0.012
Sex	-0.5266	0.5520	-0.95	0.340
Marital Status	-1.2346	0.7912	-1.56	0.119
Occupation	-0.2410	0.5791	-0.42	0.677
ICT	-0.3741	0.9695	-0.39	0.700
Pseudo R^2	0.2258	-	-	-
Log likelihood	-16.0993	-	-	-
LR Chi^2	9.3900*	-	-	0.0945

⬧ Period of awareness of DM complications implies (i) a period less than 10 years (that is not earlier than 2015) or (ii) a period more than 10 years)that is earlier tjan 2015)

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The factors influencing diabetic's perception of health complications from DM were assessed with Tobit regression model. The pseudo R^2 and log likelihood value indicate that the model is appropriate for the analysis. Marital status (β = -0.34, $p<0.01$) was the only factor that significantly influenced the perception of diabetics on health complications from DM. Details are as presented in Table 5.

Table 5: Determinants of Diabetic's Perception of Health Complications from DM (n = 41)

Variable	Coefficient	Standard Error	t	p-Value
Constant	1.1712	0.3913	2.9931	0.0061
Age	-0.0453	0.0641	-0.7067	0.4870
Education	-0.0087	0.0135	-0.6454	0.5240
Sex	-0.0539	0.1209	-0.4458	0.6601
Marital Status	-0.3448***	0.1131	-3.0486	0.0060
Occupation	0.1182	0.1194	0.9899	0.3302
Diagnosis	0.0123	0.0079	1.5569	0.1321
Period	0.0042	0.1471	0.0285	0.9767
Location	0.3782	0.2020	1.8723	0.0740
Pseudo R^2	0.2700	-	-	-
Log likelihood	-8.8616	-	-	-
χ^2	6.93***	-	-	0.0001

In this study, majority of the participants had one form of formal education or the other and were in their late ages; suggesting that most aged people, with younger relatives struggling for survival, mostly depend on hospitals for proper nursing care. Also, this could mean that educated patients are well acquainted with the necessity for proper medical attention. Female and married diabetics were in the majority among the participants in this study, indicating that sedentary lifestyle associated with the daily living of most married women in Nigeria could be responsible for this phenomenon among the female.

Participants engaged in the private sector of the economy were more than those in the public sector which can be attributed to the fact that most people retire at age 60 and, at this age, they believe they are still active and thus venture into private practice. The unusual high paced operations of the private sector might have taken its toll on the feeding and living habits of the participants thereby pre-disposing them to the scourge of diabetes mellitus. Unfortunately, majority of the participants were not ICT compliant thereby robbing them of a veritable source of information on personal health management.

Furthermore, more than half of the participants became aware of having diabetes mellitus not long ago (in 2015). This highlights the levity with which most of them have managed their health over the years since almost all were diagnosed in hospitals probably when they reported ill health, which could be as a result of complications of the ailment itself.

However, the significance of education in the battle against diabetes and its complications should not be overlooked. This is because this study shows that the significant determinant of early awareness of diabetes complications by the participant diabetics was education. Moreover, more participants without formal education tend to have been diagnosed several years ago (before 2015) compared to those educated formally. This could be due to the fact that educated participants might have been using their limited knowledge on health science to manage themselves over the years unlike their uneducated counterparts who might not hesitate to seek medical attention for their health challenges. Also, participants who were living with their spouse tend to disagree that DM can lead to health complications. This can be linked to the probable care a spouse enjoys from the partner, which may assist in ameliorating the degenerative effect DM could have on the health of a diabetic.

Conclusion

The scourge of diabetes mellitus complications is most prevalent among participants engaged in the private sector because of a higher exposure to the pre-disposing factors. Most of these diabetics were diagnosed of suffering from diabetes mellitus before 2015 and, although mostly educated, were poorly ICT compliant. Thus, majority could be lacking in experience on effective self-management component of patient-centred care as well as timeliness in taking advantage of its clinical component. Furthermore, education was the key factor influencing diabetic's period of awareness of DM complications while marital status was the major determinant of diabetic's perception of health complications from DM.

On the basis of the findings in this study, the following are the recommendations been proffered:

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i. a comprehensive awareness campaign should be implemented by relevant stakeholders with a particular focus on the private sector and married individuals;

ii. stakeholders should emphasis regular medical check-up in diabetes mellitus control efforts particularly among the educated individuals.

Conflict of Interest
There is no conflict of interest whatsoever at every stage of this study.

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