Introduction

Type 2 diabetes is said to be positioned to be one of the largest epidemics in human history and one of the major threats to human health in the 21st century (Zimmet, Alberti, & Shaw, 2001). World Health Organization (2004) estimated that there were 1.71 million people living with diabetes in Nigeria and the figure was projected to reach 4.94 million by the year 2030. The prevalence rate in Nigeria varies from one location to another, for example, 0.65% in rural Mangu village to 11.0% in urban Lagos. However, the prevalence rate for Nigeria is put at 3.9% (International Diabetes Federation, 2009).

Despite the tremendous success at improving the lives of those living with diabetes with technological breakthrough in biomedical sciences, the management of type 2 diabetes lies largely with those with diabetes. It includes practices that must be carried out by the patients themselves. Such practices include eating a healthy diet, performing physical exercise, taking medication as prescribed, monitoring of blood glucose level, regular clinic visits, and managing stress, among other practices (American Diabetes Association, 2002). However, performing these practices has remained problematic for those living with the condition as it requires behavioral change. Chinenye et al. (2012) and Chinyere, Nandy, and Nwankwo (2010) claimed that most Nigerians with diabetes have suboptimal glycemic control, are hypertensive, have chronic complications of diabetes mellitus, and do not practice self-monitoring of blood glucose. Okafor and Ofoegbu (2012) observed suboptimal glycemic, blood pressure control and dyslipidemia and overweight among subjects studied. A study on illness beliefs and diabetes in Uganda adults identified patients’ limited knowledge about diabetes in general as a major problem in diabetes management (Ujelm & Nambozi, 2008). Baumann, Opio, Otim, Olson, and Ellison (2010) found that few patients did home glucose monitoring, considered activities of daily living as regular exercise, and lack healthy food choices.

If people living with diabetes are to follow their physicians’ recommendations, it is imperative for the physicians to understand their knowledge of diabetes and health beliefs about diabetes and how these affect their following physicians’ recommendations. Understanding knowledge of diabetes and health beliefs may help in designing an effective intervention program for those living with diabetes. Therefore, this study was conducted to understand the association and influence of diabetes knowledge and health belief on diabetes management among the Igala in Kogi State, Nigeria.

The Igala are an ethnic group in Kogi east, Nigeria. They are found around the triangle formed by the confluence of
River Niger and River Benue and are located east of the confluence. Boston (1969) likens the location of the Igala to Poland in Europe, which seems to have been pulled in different directions at different periods. The Igala still hold on to their traditions, including the belief that traditional medicines can cure all kinds of illnesses. There are no data on the incidence and prevalence of diabetes among the Igala except the national prevalence rate of 3.9 %, as estimated by the International Diabetes Federation (2009) for Nigeria.

**Theoretical Framework**

The health belief model (HBM), developed by Becker and Maiman (1975), is useful in explicating self-care activities such as diabetes management recommendations and has a focus on behavior related to the prevention of disease. The foundation of the HBM is that individuals will take action to prevent, control, or treat a health problem if they perceive the problem to be severe in nature; if they perceive that the action will yield or produce an expected outcome; and because of the perceived negative consequences of therapy.

The HBM has been applied to a broad range of health behaviors. Three broad areas can be identified: (a) preventive health behaviors, which include health promoting (such as diet, exercise) and health-risk (such as smoking) behaviors as well as vaccination and contraceptive practices; (b) sick-role behaviors, which refer to compliance with recommended medical regimens, usually following professional diagnosis of illness; and (c) clinic use, which includes physician visits for a variety of reasons. The HBM states that an individual’s behavior can be predicted based on certain issues that the individual may consider (perceived susceptibility, perceived severity, perceived benefits, and perceived barriers) when making a decision about a particular behavior concerning his or her health (Glanz, Lewis, & Rimer, 1990). These concepts were proposed to account for people’s “readiness to act.” An added concept, cues to action, would activate that readiness and stimulate overt behavior, while the concept of self-efficacy, or one’s confidence is the ability to successfully perform an action. These concepts were added to help the HBM fit better the challenges of changing habitual unhealthy behaviors, such as being sedentary, smoking, or overeating.

Using HBM, the likelihood of individuals with diabetes mellitus adhering to biomedical prescription is determined by certain variables. The first variable, susceptibility, refers to the perception of vulnerability to diabetes and its complications. How do individuals perceive developing problems due to diabetes, for example, hypoglycemia and hyperglycemia? An individual’s perception of diabetes complications will likely motivate him or her to adhere to medical prescriptions. The second variable, severity, is the perception of diabetes as a serious illness, ranging from perceiving complications, such as blindness, to viewing diabetes as a life-threatening disease. The third variable, benefits, concerns the perception that the diabetes regimen will be effective. For example, taking regular exercise and eating regulated meals will make the patient feel better as a result of taking these actions. The fourth variable, barriers, refers to the perceived costs of adhering to the regimen. This deals with how inconvenient the regimen is perceived to be, for example, how much will it cost a patient to buy the drugs for a month considering other responsibilities before the patient. Finally, cues to action deals with either external (e.g., reminders from family members when to take medications) or internal (e.g. feeling high and low blood sugar) cues the individual associates with taking action.

**Research Design**

A convenient sample of 152 men and women living with diabetes who met the selection criteria and agreed to participate in this study constituted the participants for the study. The respondents were selected from seven hospitals owned by governments, private individuals, and faith-based organizations that served as both out-patient and in-patient clinics. The respondents were approached as they came in to see their doctors or to have a blood glucose test. The selection criteria for inclusion included the following: the individual must have been diagnosed by a medical doctor as having diabetes, he or she must be attending clinics for treatment and check-ups, he or she must be mentally sound to respond to questions, and he or she must give a voluntary consent to participate in the study. The instruments were in-depth interview guide and questionnaire, which was either self-administered or interview administered, depending on the literacy level of the respondent. For the illiterate respondents, the questionnaire was transcribed from English to the Igala language and back to English by experts in spoken and written Igala. The questionnaire included questions on socio-demographic characteristics and diabetes knowledge test (DKT) and diabetes HBM developed by Given, Given, Gallin, and Condon (1983), on perceived susceptibility, perceived severity, perceived benefits, and perceived barriers. These were used to measure the diabetes knowledge and beliefs about diabetes from those with the condition. The study was conducted between August 2008 and December 2009. The study was approved by the ethical committee of Kogi State Ministry of Health.

**Measurement of Diabetes Knowledge, Health Beliefs Diabetes Management**

The DKT consisted of 7 items administered to the respondents. The 7 items were directly from the University of Michigan DKT (2006) of 14 items but with modification, substituting the food items on the original DKT with the locally available food consumed in the study population. The respondents were scored based on total correct responses out of 7 items and were classified as either having low or high diabetes knowledge.
The study adopted 16 questionnaire items, as developed by Given et al. (1983), on perceived susceptibility, perceived severity, perceived benefits, and perceived barriers, to measure the beliefs of diabetic patients about their diabetes. The items were measured on a 5-point scale, ranging from strongly disagree to strongly agree. To quantitatively capture the degree of agreement to each item by the respondents, the items were scored from the lowest to the highest. The item scores for each scale were then summed up to serve as the measure for the respective attribute. To ascertain how many of the respondents scored high (good or satisfactory) or low (bad or poor) on each of the attributes, a norm above which a person was high and below which was low was created by adopting the mean. This enabled ranking as high or low, good or poor. The HBM scale consisted of 16 items and was found to be reliable (16 items: \( \alpha = 71 \)), the subscales of perceived susceptibility (\( \alpha = 72 \)), perceived severity (\( \alpha = 63 \)), perceived benefits (\( \alpha = 74 \)), and perceived barriers (\( \alpha = 71 \)).

Diabetes management was measured using self-reports of the respondents on the performance of their physicians’ recommendations on medication, regular blood glucose testing, weight management, eye and foot examination, regular clinic visits, and regular physical exercise. However, metabolic control was not included, as it requires blood samples which were not performed in this study. Using the same method described above, participants’ responses were scored, ranked, and classified as good or poor and high or low.

**Results and Analyses**

A total of 54% of the respondents were women, whereas 46% were men. The respondents’ mean age was 56. The mean age support Nyenwe, Odia, Ihekwaba, Ojule, and Babatunde (2003), who state that diabetes is more frequently found in people aged 50 years and above in Nigeria. Also, 29% of them had no formal education, 23% had primary education, 18% secondary education, and 26% post-secondary education. Besides, 34% were civil servants, 18% were self-employed, 14% were retirees, and 15% were not in any paid employment, whereas 12% were housewives.

**Diabetes Knowledge**

Table 1 below shows that 38% of the respondents could not identify food that contains carbohydrate, and 43% could not identify food with the highest concentration of fat. About 36% did not know what is the best method for testing blood glucose, while 9% said that it is through urine testing. On the issue of exercises, 46% did not know the effects of exercises on individuals.

Regarding taking care of the feet, 32% did not know how to take care of their feet. About 57% knew how best to manage their feet, while 12% got it wrong on how to take care of the feet. About 59% did not know the effect of eating food that contains less fat, 18% said that it decreased the risk of kidney problem, whereas about 15% asserted that it decreases the risk for heart diseases.

Table 2 above shows that 49% of the participants had low diabetes knowledge, whereas 51% had high diabetes knowledge. This result may be attributed to the low level

| Diets knowledge test | Frequency | %  |
|----------------------|-----------|----|
| Fried chicken        | 6         | 3.9|
| Akamu                | 80        | 52.6|
| Unripe plantain      | 8         | 5.3|
| Don’t know           | 58        | 38.2|
| Total                | 152       | 100.0|

| Which of the following is highest in fat? |
|-----------------------------------------|
| Low fat milk                           |
| 64                                      | 42.1|
| Orange juice                           |
| 8                                       | 5.3|
| Corn                                   |
| 14                                      | 9.2|
| Don’t know                             |
| 66                                      | 43.4|
| Total                                  |
| 152                                    | 100.0|

| Which is the best method for testing blood glucose? |
|----------------------------------------------------|
| Urine testing                                      |
| 14                                                  | 9.2|
| Blood testing                                      |
| 66                                                  | 43.4|
| Both are equally important                         |
| 18                                                  | 11.8|
| Don’t know                                         |
| 54                                                  | 35.5|
| Total                                              |
| 152                                                | 100.0|

| For a person in good control, what effect does exercise have on blood glucose? |
|-----------------------------------------------------------------------------|
| Lowers it                                                                    |
| 74                                                                           | 48.7|
| Raises it                                                                    |
| 4                                                                            | 2.6|
| Has no effect                                                                |
| 4                                                                            | 2.6|
| Don’t know                                                                   |
| 70                                                                           | 46.1|
| Total                                                                        |
| 152                                                                           | 100.0|

| The best way to take care of your feet is to                                  |
|-----------------------------------------------------------------------------|
| Look at and wash them each day                                              |
| 86                                                                           | 56.6|
| Massage them with rub each day                                              |
| 14                                                                           | 9.2|
| Soak them for one hour each day                                             |
| 4                                                                            | 2.6|
| Don’t know                                                                   |
| 48                                                                           | 31.6|
| Total                                                                        |
| 152                                                                           | 100.0|

| Eating food lower in fat decreases your risk for:                           |
|-----------------------------------------------------------------------------|
| Nerve disease                                                               |
| 4                                                                            | 2.6|
| Kidney problems                                                            |
| 28                                                                           | 18.4|
| Heart disease                                                               |
| 22                                                                           | 14.5|
| Eye disease                                                                 |
| 8                                                                            | 5.3|
| Don’t know                                                                  |
| 90                                                                           | 59.2|
| Total                                                                        |
| 152                                                                           | 100.0|

| Which of the following is not usually associated with diabetes?              |
|-----------------------------------------------------------------------------|
| Vision problems                                                             |
| 12                                                                           | 7.9|
| Kidney problems                                                             |
| 6                                                                            | 3.9|
| Nerve problems                                                              |
| 10                                                                           | 6.6|
| Lung problem                                                                |
| 30                                                                           | 19.7|
| Don’t know                                                                  |
| 94                                                                           | 61.8|
| Total                                                                        |
| 152                                                                           | 100.0|

Source. Underlying data from survey, 2009.
of education among the participants. Besides, most of the participants were only counseled after diagnosis on what to do and what not to do.

Table 3 reveals that 30 respondents, representing about 41% of those with low level of diabetes knowledge, had good diabetes management, whereas 50 respondents, representing about 64% of those with high level of diabetes knowledge, had good diabetes management status. About 60% of the respondents with low level of diabetes knowledge had poor management status, whereas 36% of those with high level of knowledge had poor management status. The result further shows that there was an association between level of diabetes knowledge and diabetes management status (1, \(N = 152\) = 8.456, \(p = .004\)). The result shows no relationship between perceived susceptibility to diabetes complications with good diabetes management. However, the chi-square statistics result shows no relationship between perceived susceptibility and diabetes management (\(p > .05\)). Hence, the hypothesis that stated that perceived susceptibility to complications of diabetes will motivate the individual to follow doctor’s recommendations was rejected.

**Perceived severity.** The respondents reported their belief of severity of their diabetes by rating how serious their diabetes will have bad effect on their future health (for instance, “my diabetes will cause me to be sick a lot”). The means of these ratings served as measures of perceived severity (\(M = 13.38, SD = 2.07\)). Four items assessed perceived severity on a 5-point scale, ranging from strongly agree to strongly disagree.

The bivariate analysis showed that 73% and 17% of those with low and high perception of severity had poor diabetes management status, respectively, whereas 27% and 83% of those with low and high perception of severity of diabetes, respectively, had good diabetes management status. The analysis shows a significant relationship between perception of severity and diabetes management (1, \(N = 152\) = 47.5555549, \(p = .000\)).

**Perceived benefits.** Four items were used to measure perceived benefits of taking action by the respondents. Examples are “I believe I can control my diabetes” and “my medicine would make me feel better” assessed on a 5-point scale of strongly disagree to strongly agree. The mean of the four items served as the measure of perceived benefits (\(M = 17.16, SD = 2.20\)).

The bivariate result showed that 35% and 64% of those with low and high perceived benefits had poor diabetes management status, respectively, had poor diabetes management status, whereas 65% and 36% of those with low and high perceived benefits of following biomedical recommendations, respectively, had good diabetes management status. The statistics showed that there was a significant relationship between perceived benefits and diabetes management (1, \(N = 152\) = 12.383, \(p = .000\)).

**Perceived barriers.** The respondents rated four items acting as barriers to diabetes management status on a 5-point scale, ranging from strongly disagree to strongly agree. These included “I would have to change too many habits
and follow my prescriptions” to “following prescriptions interfere with my normal daily activities.” The mean of the rating was used to measure the perceived barriers (M = 11.88, SD = 2.48); higher scores showed more barriers to diabetes management.

Table 1 shows that 54% and 46% of those with low and high perceived barriers, respectively, had poor management status, whereas 46% and 59% of those with low and high perceived barriers to following recommendations had good management status. The chi-square result showed that there was no significant relationship between perceived barriers and diabetes management (p > .05). Hence, the hypothesis which states that perceived barrier will impede the individual from following doctors’ recommendations was rejected.

The result on the aggregate of all subscales of HBM showed that 42% and 51% of those with low and high perception of health belief, respectively, had poor diabetes management status, whereas 58% and 49% of those with low and high perception of health belief, respectively, had good management status. The result shows that statistically there is no relationship between the aggregate health belief and diabetes management.

Regression Analysis

A further analysis in Table 6 shows that health belief (β = .07865, t = 2.439, p < .016) was found to have strong influence on diabetes management.

| Table 5. Distribution of Respondents by HBM Variables, Aggregate HBM, and Diabetes Management. |
|-----------------------------------------------|
| HBM variables                      | Poor | Good | Total | df  | χ²  | p value |
| Perceived susceptibility  |       |      |       |     |     |        |
| Low                             | 32 (40.0) | 48 (60.0) | 80 (100.0) | 1 | 3.678 | .055 |
| High                           | 48 (55.6) | 32 (44.4) | 72 (100.0) |     |     |        |
| Total                          | 72 (47.4) | 80 (52.6) | 152 (100.0) |     |     |        |
| Perceived severity            |       |      |       |     |     |        |
| Low                             | 60 (73.2) | 22 (26.8) | 82 (100.0) | 1 | 47.549 | .000 |
| High                           | 12 (17.1) | 58 (82.9) | 70 (100.0) |     |     |        |
| Total                          | 72 (47.4) | 80 (52.6) | 152 (100.0) |     |     |        |
| Perceived benefits             |       |      |       |     |     |        |
| Low                             | 30 (34.9) | 56 (65.1) | 86 (100.0) | 1 | 12.383 | .000 |
| High                           | 42 (63.6) | 24 (36.4) | 66 (100.0) |     |     |        |
| Total                          | 72 (47.4) | 80 (52.6) | 152 (100.0) |     |     |        |
| Perceived barriers             |       |      |       |     |     |        |
| Low                             | 38 (54.3) | 32 (45.7) | 70 (100.0) | 1 | 2.490  | .115 |
| High                           | 34 (41.5) | 48 (58.5) | 82 (100.0) |     |     |        |
| Total                          | 72 (47.4) | 80 (52.6) | 152 (100.0) |     |     |        |
| Aggregate HBM                  |       |      |       |     |     |        |
| Low                             | 28 (42.4) | 38 (57.6) | 66 (100.0) | 1 | 1.144  | .285 |
| High                           | 44 (51.2) | 42 (48.8) | 86 (100.0) |     |     |        |
| Total                          | 72 (47.4) | 80 (52.6) | 152 (100.0) |     |     |        |

Note. HBM = health belief model.

Table 6. Relative Influence of Health Belief on Diabetes Management.

| Unstandardized coefficients | Standardized coefficients |
|-----------------------------|---------------------------|
| B   | SE  | β   | T  | Significance |
| 1.818 | 1.926 | 0.944 | .347 |
| Health belief | 0.07865 | 0.032 | .195 | 2.439 | .016 |

Discussion and Conclusion

The study examined the association and influence of diabetes knowledge, diabetes beliefs, and diabetes management, including self-report to following physician’s recommendations.

The result which linked high level of diabetes knowledge with poor management status supports a similar study that found good level of diabetes knowledge with poor adherence to recommendations (Al-Deagi, McElnay, & Scott, 1995). The association between diabetes knowledge and diabetes management supports a study that has demonstrated that increased glycemic control is associated with higher scores of diabetes knowledge (Colleran, Starr, & Burge, 2003).

In this study, diabetes knowledge was associated with management status. This agrees with Glasgow and Anderson’s (1999) claim that disease-specific diabetes knowledge may be a process or mediating variable that
interacts with other factors to affect self-care, which may affect short- and long-term health outcomes. This may be related to the perceived susceptibility of health belief, particularly the assertion that knowledge of the complications of diabetes may lead to taking the necessary preventive measures.

The study showed that, even though some respondents had high diabetes knowledge, some of them still had low management status. This finding is in line with the study by Bautista-Martinez et al. (2008) that the acquisition of diabetes-related knowledge is not enough to increase compliance with diabetes treatment. According to Klepac (1996), individuals will not carry out a health-related behavior unless they have at least a minimal level of health motivation and knowledge, see themselves as vulnerable and the condition as threatening, are convinced of the health behavior efficacy, and find few barriers to the action. Arsenneau, Mason, Wood, and Green (1994) have found that illness-specific knowledge is one component of effective self-management, whereas Hill-Briggs (2003) and Lorig et al. (1996) identify other components to include behavioral skills, cognitive problem-solving abilities, and a sense of efficacy in bringing these capabilities to bear to affect disease outcome. The implication of the finding is that diabetes knowledge is an important factor on how patients will follow their management plan but should not be seen as an end in itself.

The low level of diabetes knowledge found in this study compares relatively with other studies on diabetes knowledge by Fitzgerald et al. (1998) and Murata et al. (2003). While other empirical evidences from other studies suggest that people affected with diabetes often have inadequate knowledge about the nature of diabetes, its risk factors, and associated complications (Jabbar, Contractor, Ebrahim, & Moahmood, 2001; Kamal, Biessels, Duis, & Gispen, 2000). Consensus among the health care providers in the communities attests to the low level of diabetes knowledge in the study communities they described the level of diabetes knowledge among the people as shallow.

As the findings show, perceived severity and perceived benefits were significantly related to diabetes management. This may be explained by the fact that not all the constructs of HBM will directly affect diabetes management. Rather, other factors, such as socio-demographic characteristics, diabetes knowledge, perception, psychosocial factors, patients’ factors, and cultural beliefs (Arndt et al., 2001; Williams, Whittle, & Gatrell, 2002), will have to be all present to activate the beliefs.

For the present study, the health beliefs related with diabetes management were perceived severity and perceived benefits. This finding is supported by Glasgow, McCaul, and Schafer (1986), who avers that beliefs about treatment effectiveness appear to have an important influence on diabetes self-management. Ayele, Tesfa, Abebe, Tilahun, and Girma (2012) also found that those respondents with high perceived severity of diabetes and less perceived barrier to self-care were more likely to take diabetes self-care. Garcia and Mann (2003) also confirmed the predictability of three variables out of the four variables, with susceptibility, barriers, and benefits explaining 43% of the variance of intention to resist dieting. Nejad, Wertheim, and Greenwood (2005) found that the best predictors of weight loss were perceived susceptibility and perceived benefits, while perceived benefits of dieting and severity (a measure of how negatively weight gain is perceived) significantly predicted intention to diet.

Similarly, Cerkoney and Hart (1980) found that the combination of the five HBM variables accounted for 25% of the variance in adherence, as measured by self-report in combination with a reactive direct observational procedure. Based on the results from this study using HBM, it can be said that HBM alone is a poor predictor of diabetes management among those with diabetes in the studied population. This is evident as only perceived severity and perceived benefits had significant relationships with diabetes management. The value expectancy assumption of the model seems weak among the study respondents. This could be linked to the belief among the Igala that all diseases are curable using local herbs from competent herbalists. This result supports Adejoh’s (2011) claim that, among the Igala, there is a strong belief in Igala medicine in curing all kinds of diseases. This could have implications for how a person will manage his or her condition. Hence, using HBM alone could be misleading and lead to wrong decisions and judgments.

The findings of this study are in line with a review which found that the individual components (severity, susceptibility, benefits, and barriers) each only accounted for 0.5% to 4% of the variance in behavior (Harrison, Mullen, & Green, 1992). Brownlee-Duffeck et al. (1987) found that measures of health beliefs accounted for 41% to 52% of the self-reported adherence and that perceived severity and perceived benefits were associated with greater self-reported adherence and metabolic control.

This study was not an experimental design and was limited to self-report of the respondents. Hence, the validity of the model in this population has not been tested. The study only took a convenient sample from one ethnic group in an ethnically diverse region. So the generalization of these findings must be with caution. Also, the responses to all the questions were all self-reports. There could be the problem of recall from the respondents, which might make the reliability of the responses difficult to validate. Besides, this report was limited to diabetes knowledge and health beliefs using HBM and so did not give room to examining cultural beliefs affecting diabetes management among the studied population. Similarly, only four components of the earlier version of HBM were used to measure health beliefs in this study, hence the need to expand the study and include the added components of the revised model. However, it is hoped that the findings from this study will stimulate further studies on diabetes knowledge, health beliefs, and diabetes management in Nigeria, with particular focus on cultural beliefs in relation to diabetes health beliefs.
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