

# Knowledge, Attitude, and Practice on type 2 Diabetes Mellitus of Adult Patient using Data Mining Approach in Nigeria

Jayeola Tolulope Grace \*, Oroniran Oluyinka

Department of Nutrition and Dietetics, College of Health Sciences, Bowen University, Iwo

\*Corresponding author: Jayeola Tolulope Grace, Department of Nutrition and Dietetics, College of Health Sciences, Bowen University, Iwo

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## Abstract:

Diabetes mellitus is a serious public health problem that leads to substantial disease and death rate. Diabetes has resulted into a lot of complications such as renal failure, retinopathy, and heart diseases and is accounted as the 7th leading cause of death worldwide. This study was carried out to determine the knowledge, attitude and practice of adult patient living with type 2 diabetes using data mining approach in Nigeria.

The participants from this study were from secondary data obtained from different journals from seven states in Nigeria. Data were collected using data mining approach from numerous set of data to get hidden knowledge. Data was entered using IBM Statistical Package for Social Sciences (SPSS) and was analyzed using both descriptive and Chi-squared automatic Interaction detection (CHAID) analysis. CHAID was used to develop the decision tree model which is used for the prediction of the knowledge, attitude and practice.

Result showed that the participants comprised 2070 participants of which 56.8% were female and 43.2% were male. The Socio demographic characteristics have been revealed to have a role in the knowledge, attitude and practice of type 2 diabetic patient in that it is found out that marital status is the major determinant of knowledge in type 2 diabetic patients because about 100% of adult patient with marital status had good knowledge of 89.8%, also education is the major determinant of attitude in type 2 diabetes patients and knowledge is the major determinant of practice in type 2 diabetes patients. The adult patient had good knowledge on type 2 diabetes of 59.5%, poor knowledge of 31.1% and fair knowledge of 9.5%. This study also shows that 47% of diabetes mellitus patient had good attitude. 8.6% had fair attitude, and 44.4% had poor attitude of the ailment. Also, the study also shows that 52.5% of type 2 diabetes mellitus had good practice, 21.9% had fair practice and 25.6% had poor practice.

Therefore, this study concluded that majority of the patient had good knowledge of diabetes. Nevertheless, there is a need to educate patient on issues relating to diabetes mellitus and ensure compliance to the interventions needed in the management of type 2 diabetes mellitus.

**Key words:** knowledge; attitude; practice; type 2 diabetes; data mining

## Introduction

Diabetes is a collection of metabolic illness described through abnormally high blood sugar as a consequence of defects in insulin secretion, insulin action, or the two (American Diabetes Association, 2004). The persistent hyperglycemia level of diabetes is said to prolonged damage, impaired functioning, and multiple organ failure, mostly the eyes, renal, coronary, as well as blood vessels (Chukwuma, 2012). The idea about the abnormalities in sugar, fat, and protein metabolism in diabetes is insufficient activity of insulin on target tissues.

The most widely seen manifestations are abnormal frequent urination; increase in appetite and additionally in thirst). Its side effects can stimulate

so many different severe complications, if not treated immediately, the first-rate of life and life expectancy of the patients are also reduced. (Finucane et al, 2011). The most occurring problems happen in the body are high osmotic concentration, diabetic ketoacidosis, high blood glucose as well as human death (Vankudre et al, 2013). Diabetes can result to the prolonged problems such as heart diseases, renal damage, prolonged ulcers, blindness and damage of eyes.

Type 2 diabetes mellitus otherwise called Non-insulin Dependent Diabetes Mellitus (DM) is the most accepted form of DM recognized by high blood glucose, insulin resistance, and insulin insufficiency (Maitra, 2005). Individuals surviving with type 2 DM are further at risk against

different types of both short-and long- lived problems, which further contribute to their un timely death. The propensity of high disease and death rate is seen in patient with type 2 DM. In 2012 there have been about 1.5 million deaths due to diabetes and about 95% of all manifestation reported were imputed to Type-2 diabetes mellitus (International Diabetes Federation, 2015). Type-2-diabetes mellitus is not any question a serious dilemma within the world today especially in the way it impair the quality of human life.

In spite of the enormous accomplishment at amending the lives of those living with diabetes with technical breakthrough in therapeutic sciences, the control of type 2 diabetes lies to an excellent extent with those with diabetes. It includes the knowledge, attitude and practices of the diabetic patient. In DM management, the greatest choices influencing the health of individuals with diabetes are tailored by themselves and not by their doctor or any other medical care provider (Gulcin et al., 2011). Hence, the comprehension of food lifestyle amidst individuals with DM using Knowledge, Attitude and Practice (KAP) will affect overall DM control because nutrition education is probably going to be potent if we all know the knowledge, attitude and practices of DM patients about their dietary patterns. It includes practices that got to be administered by the individuals themselves. Such practices includes eating a healthy diet, physical activity, taking drugs as prescribed, monitoring of blood sugar level and regular hospital visits (American Diabetes Association, 2002). Nevertheless, achieving these practices has continued to be questionable for those surviving with the disease as it requires change in behavior. It is therefore advisable for the Dietitian to know their knowledge, attitude and practice of diabetes and how these influence their management following doctor's prescription. Understanding these helps in planning a cogent intervention program for those living with diabetes (Samuel, 2014). Data about the patient is gathered within the sort of patient records in the clinics. Information findings for predictive role are done through data mining, which is an analytics that aid in suggesting conclusions (Sohail et al., 2018). This approach assists in making conclusion by algorithms from big amounts of information generated by hospitals. Taking into account, the significance of knowledge, attitude and practice of diabetic patient in the management of type 2 diabetes, data mining approach can be applied to help in the control of type 2 diabetes at a and treatment, which may help in avoiding complications.

## Materials and Methods

The methodology used in the study include; research design, inclusion criteria, exclusion criteria, ethical considerations, sample and sampling technique, procedure for data gathering and method of data analysis.

### Research Design

It is an approach for supplying information and knowledge selection. Data mining approach can be used to translate unknown knowledge into evident knowledge. This research therefore aimed to use data mining to explore the connections between personnel attribute and its effect on performance. Through the suggested methodology, unknown knowledge could have been drawn out from numerous sources of data. In this research, use of data mining for Knowledge, attitudes and practice of patient with type 2 diabetes proffers solution on diabetes patients for improving the choice of life of an individual which in turn provide help to physicians and dietitian in the management of type 2 diabetes.

### Inclusion Criteria

The target population for this study consists of only adult patient within the age range of 30 – 94 years with type 2 diabetes mellitus in Nigeria.

### Exclusion criteria

Type 2 Diabetes Mellitus ill patient less than 30 years old and gestational Diabetes mellitus patients were excluded from this study.

## Ethical Considerations

Data mining technique is focused on previously conducted studies and does not involve any study with human or animal participant.

## Sample and sampling technique

The participants for the study were from secondary data obtained from selected 7 states in Nigeria (Oyo state, Ondo state, lagos state, Akwa ibom state, Abia state, Plateau state and kogi state). Only adult patient with type 2 diabetes mellitus was equally randomly selected.

## Procedure of Data Collection

The data were collected using data mining approach. Data mining approach is the procedure of collecting data or information from numerous data sets through different techniques drawn from the field of statistics. The procedure is a ways or process of creating vital information from the available data from a numerous set of any data researcher got the consent of each participant in the study. The data were collected from 7 journals, these are:

1. Knowledge of self- care among type 2 diabetes patients in two states of Nigeria. (Idongesit et al., 2014)
2. Knowledge and Factors associated with treatment compliance among diabetes mellitus patients in selected hospitals in Ibadan(University College Hospital, Ring road state Hospital and Oluyoro Oke Offa Catholic Hospital, Ibadan) (Funmilola et al.,2017).
3. Nutrition Knowledge, dietary habit and Nutritional status of diabetic patients attending teaching hospitals in Lagos, Nigeria. (Lagos University Teaching Hospital (LUTH) and Lagos state University Teaching Hospital (LASUTH) (Olatona et al., 2019).
4. Diabetes knowledge, health belief and diabetes management among the Igala, Nigeria (Samuel, 2014).
5. Knowledge and Attitude of a semi urban community in the south-south region of Nigeria (Federal Medical Centre, Owo, Ondo State) (Faith an Olayinka, 2014).
6. Knowledge, Attitude and Practice of individuals with type 2 diabetes mellitus in a tertiary health care centre, Umuahia, (Nigeria Federal Medical Centre, Umuahia, Abia State (Odenigbo et al.,2012).
7. Assessment of individual's knowledge and Attitude towards Diabetes and its association with glycemic control: A cross- sectional study in a Nigerian tertiary Hospital UNN Enugu state (Anakwue et al., 2019).

## Data Mining Model

Data mining is a big aggregation of methods for mining information. It can through association, clustering, classification or regression methods. In this study classification was used for data mining.

## Method of Data Analysis

Data were collected and analyzed using IBM Statistical Package for social sciences (SPSS) version 23. IBM statistical package for social science is a data mining and test analysis based tool for predictive and analytical purposes. It provides advanced data mining algorithms and technique to build models for different analytical purposes. SPSS was used for Descriptive analysis to display data in frequencies and percentage. Chi-squared automatic interaction detection (CHAID) analysis was used to develop the decision tree model and also used for the prediction of the knowledge, attitude and practice of type 2 diabetes patient.

Socio-demographic characteristics of the respondents were analyzed using descriptive analysis to obtain the frequencies and percentages.

Decision tree was used for the data mining approach due to its effectiveness in predicting models to solve various diabetes mellitus tasks. Chi-squared automatic interaction detection (CHAID) decision tree was used for the data mining approach because it is a supervised learning for decision tree development and is used to detect connection between the categorical dependent variable and multiple independent variable, its output is highly visual and easy to interpret with multiple trees compared with other decision tree algorithm such as CART (Classification and Regression Tree) and QUEST (Quick, Unbiased, Efficient Statistical Tree).

Knowledge, attitude and practice were directed as categorical dependent variable in which the categories are granted good, fair and bad. In CHAID analysis, the categorical data were divided into subunits and their outcome on the dependent variables was tested. The categories were incorporated for illustrative variable and the p values and  $\chi^2$  statistics were calculated. CHAID analysis shows the most significant explanatory variables and their connection with dependent variables through a tree plot. Socio demographic characteristics that affect knowledge, attitude and practice were analyzed using CHAID analysis.

**Results**

The results gotten from this study was generated from collation of data on knowledge, attitude and practice of type 2 diabetes mellitus from different zones in Nigeria using data mining approach.

Table 1 shows the socio-demographic characteristics of the various respondents with 895(43.2%) being male and majority being female 1175(56.8%). Most 1149(55.5%) of the respondents were above 60 years of age while ages 30-40 were 424 (20.5%). About 664(32.0%) had no formal education while 547(26.4) had tertiary level of education. Majority 1152(55.7%) were employed while 918(44.3%) were unemployed.

**Discussions**

In this study, the demographic characteristics of patients (gender, age, education, status, and religion) that affect their Knowledge, attitude and practice were analyzed using CHAID analysis. The knowledge, attitude, and practice of the patient were categorized as being good, fair or poor.

**Table 1** represents the socio demographic characteristics of the studies participant. The participants comprised 2070 participants of which 1175 where female and 895 were male. About 424 participant ranges between the age of 30-40 years, 284 participants ranges between the age of 40-50 years, 213 participant ranges between the age of 40 – 50years and 1149 participant are 60 yrs and above. 32% of the participant received no formal education. Only about 55.7% of the participants were unemployed while the rest were employed. 58% of the participants were Christians while the rest were Muslims. 66.9% of the participants were married and only about 14.2% were single.

Characteristics	Number	Percent (%)
<b>Sex</b>		
Male	895	43.2
Female	1175	56.8
<b>Age</b>		
30-40	424	20.5
41-50	284	13.7
51-60	213	10.3
Greater than 60	1149	55.5
<b>Educational level completed</b>		
None	664	32.0
Primary	464	22.4
Secondary	391	18.8
Tertiary	547	26.4
Post graduate	4	0.2
<b>Occupation</b>		
Employed	1152	55.7
Unemployed	918	44.3
<b>Religion</b>		
Christian	1202	58
Muslim	868	41.9
<b>Status</b>		
Divorce	1.1	23
Married	1385	66.9
Single	294	14.2
Widow	368	17.8

**Table 1:** Socio demographic characteristics of the type 2 diabetes (n=2070)

**Figure 1** shows the result of the CHAID analysis in indicated that created model contains within 3 levels of tree depth, a total of number of nodes is 19, a total number of terminal nodes is 13. The CHAID decision tree result for knowledge of type 2 diabetes patient. This shows how gender, practice, occupation, age and status were found to affect the knowledge of the patient. The status has the most significant effect on the patient which means that it is most strongly associated with knowledge (dependent variable) and has more power in the classification of attribute into groups ( $\chi^2=1151$  df =6, p value =0.000.). This variable split into 4

nodes (node1, node2, node3, and node4). The status divisions are as follows: good knowledge of 80.6%, fair knowledge of 6.9% and poor knowledge of 12.5% were found among patients who are married. Patients who are divorce or widow have good knowledge of 2.5% and a poor knowledge of 97.5%. Good knowledge of 100% was found among patients who are single. The last node (node 4) has a good knowledge of 55.4%, poor knowledge of 20.4% and fair knowledge of 24.2%. Node 1 split into node 5, node 6, node 7, and node 8. Among married patient, there is an association between practice and the level of knowledge. Of

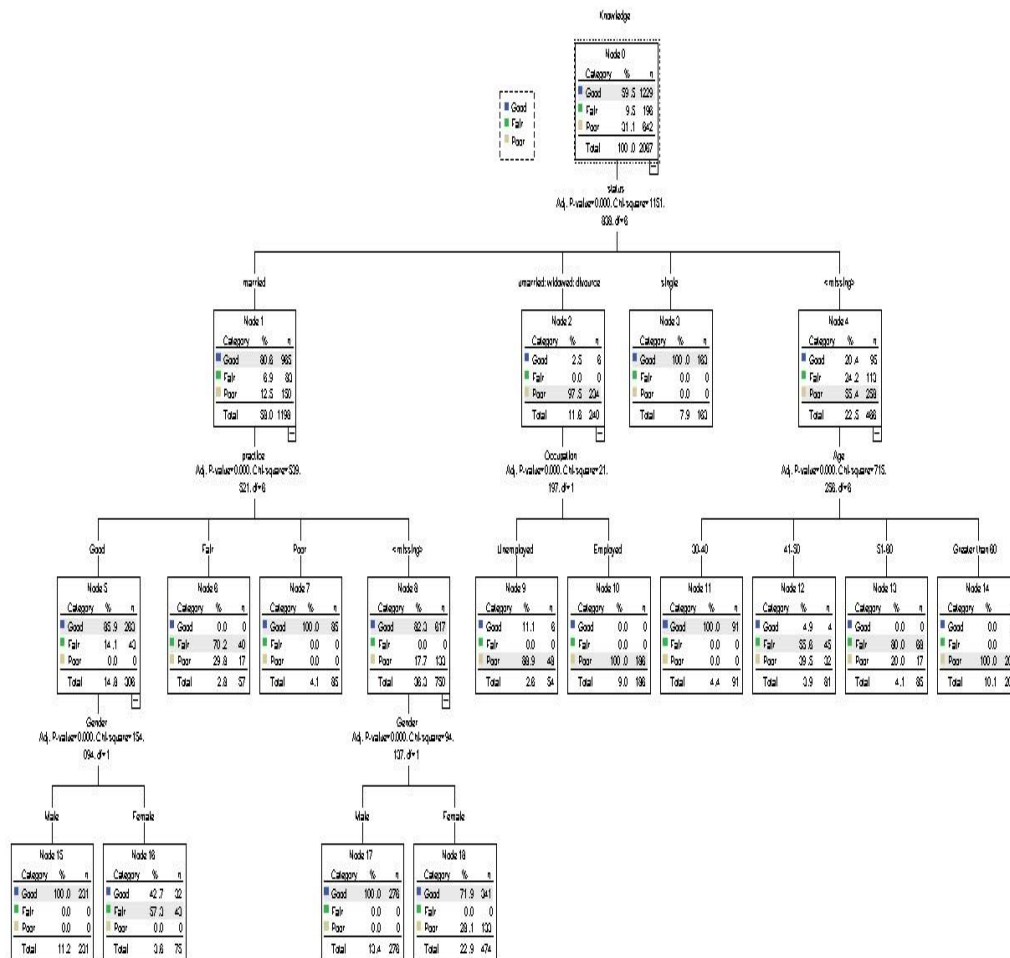
58.0% who are married in node 5, 14.8% has good practice with good knowledge of 85.9%, fair knowledge of 14.1%. There is an association between gender and level of knowledge. Also, among good practice of 14.8%, 11.2% male has 100% good knowledge and 3.6% female has fair knowledge of 57.3%. Also, in node 6 2.8% who are married has fair practice with poor knowledge of 29.8% and fair knowledge of 70.2%. In node 7, 41% who are married has poor practice of 4.1% with 100% good knowledge and in node 8, 13.4% male has good knowledge of 100% and 22.9% female has poor knowledge of 28.1% and good knowledge of 71.9%. There is also an association between gender and level of knowledge in node 8.

Node 2 split into node 9 and node10, among divorce and widow patient there is an association between occupation and level of knowledge. Of 11.6% who are widow and divorce, 2.6% are unemployed with good knowledge of 11.1% and poor knowledge of 88.9%,9.0% who are employed has poor knowledge of 100%.

Node 4 split into node 11, node 12, node 13, and node 14. Of 22.5% in node 4,44% are between the ages of 30-40 with good knowledge of 100.0%, 3.9% are between the ages of 41-50 with good knowledge of 4.9%,55.6% fair knowledge, 39.5% poor knowledge, 4.1% between the

ages of 51-60 has fair knowledge of 80.0% and 10.1% greater than 60 has poor knowledge of 100%.

The result of the CHAID analysis showed that 59.5% of diabetic patient has good knowledge, 9.5% has fair knowledge and 31.1% has poor knowledge. The result is in agreement with the research done in Oyo state of about 60% had good knowledge (Funmilola et al., 2017), whereas this is in contrast with the study done in lagos teaching hospital of only 37% has good knowledge (Olatona et al.,2019). The study results showed that knowledge of type 2 diabetes patients are affected by status, practice, occupation, age, and gender. However the most determinant for knowledge is status. The status of the patient has the most significant effect on the knowledge of the patient. According to the research, Patients who are married and single has higher knowledge of 80.6% and 100% and patients who are widow and divorce have poor knowledge of 97.5%. Also, patients who are married with good practice have higher knowledge of 85.9% and patients who are married with fair practice have fair knowledge of 70.2%. Male patients with good practice who are married have higher knowledge than female patient who are married with good practice. Also, widow and divorce patients who are employed and unemployed have poor knowledge. Patient between the ages of 30-40 has good knowledge than patient between the ages of 40 and above.



**Figure 1:** CHAID decision tree for knowledge of type 2 diabetes patient

**Table 2** shows classification matrix containing, by categories of the dependent variables i.e. the predicted classification. It is stated that the overall accuracy of the model is 88.3%. However, the percentage

structure of modeled (predicted) values according to the categories of the dependent variable (63.9%, 14.4%, 23.7% is not significantly different from that of the original data (59.5%, 9.1%, 31.1%).

Observed correct	Good	Fair	poor	%
Good	1187	36	6	96.6
Fair	0	196	0	100
poor	133	66	443	69
Overall %	63.9	14.4	21.7	88.3

**Table 2:** Classification matrix for knowledge of type 2 diabetes patient

**Figure 2** shows the CHAID decision tree result for attitude of type 2 diabetes patient. The result of the CHAID analysis indicated that created model contains within 3 levels of tree depth, a total of number of nodes is 9, a total number of terminal node is 6. This shows how education, gender and age were found to affect the attitude of patient. Education has the most significant effect on the patient which means that it is most strongly associated with attitude (dependent variable and has more power in the classification of attribute into groups( $\chi^2=733.178$  df =6, p value =0.000.)). This variable split into 4 nodes (node 1, node 2, node 3, and node 4). The education divisions are as follows: No formal education has 100% good attitude, patient with primary education has good attitude of 72.8%, fair attitude 3.0% and poor attitude of 24.2%.

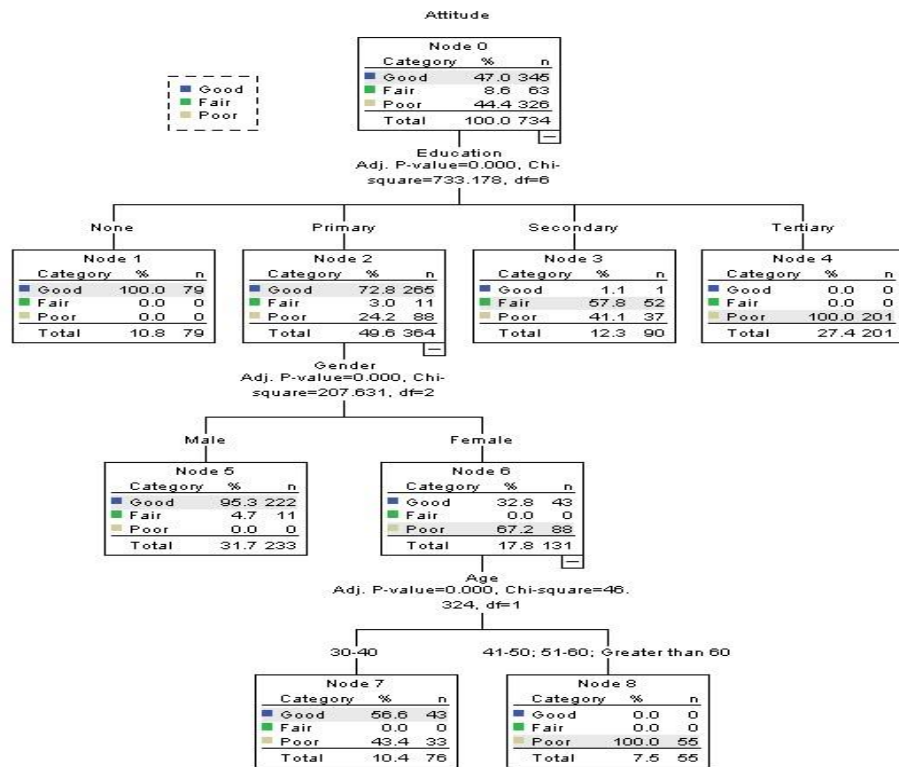
Patient with secondary education has only good attitude of 1.1%, fair attitude of 57.8% and poor attitude of 41.1%. Patient with tertiary education has poor attitude of 100%.

Node 2 split into node 5 and node 6. Among patients with primary education, there is an association between gender and level of attitude. Out of 49.6% with primary education, 31.7% are male with 95.3% good

attitude, 4.7% fair knowledge and also out of 17.8% female, 32.8% has good attitude and 67.2% poor attitude.

Node 6 further split into node 7 and node 8. Among patients with primary education, there is also an association between age, female and level of attitude. Of 17.8% female, age between 30-40 has 56.6% good attitude and 43.4% poor attitude, and 41-50 to greater than 60 has poor knowledge of 100%.

The result of the CHAID analysis showed that 47% of diabetes patient has good attitude, 8.6% has fair attitude and 44.4% has poor attitude. This study is in agreement with the research carried out in Umuahia of about only 12% had good attitude (Odenigbo and Inya, 2012). The study result shows that the attitudes of type 2 diabetes mellitus are affected by education, gender and age. However, the most determinant of attitude is attitude that patient with tertiary education. Patient with primary education and are male has good attitude education. According to the study; patient with no formal education, primary education has higher of 95.3%, patient with primary education and are female has a poor attitude of 67.2%, patient with primary education who are female between the age of 30 – 40 has good attitude than those between the ages of 40 and above.



**Figure 2:** CHAID decision tree for attitude of type 2 diabetes patient

**Table 3** represents classification matrix by categories of the dependent variables (practice) i.e. the predicted classification. It is stated that the overall accuracy of the model is 88.8%. However, the percentage structure of modeled (predicted) values, according to the categories of the dependent variable (52.9%, 12.3%, 34.9% is not significantly different from that of the original data (47.0%, 8.6%, 44.4%).

Observed correct	Good	Fair	poor	%
Good	334	1	0	99.7
Fair	11	52	0	82.5
Poor	33	37	256	78.5
Overall (%)	52.9	12.3	34.9	88.8

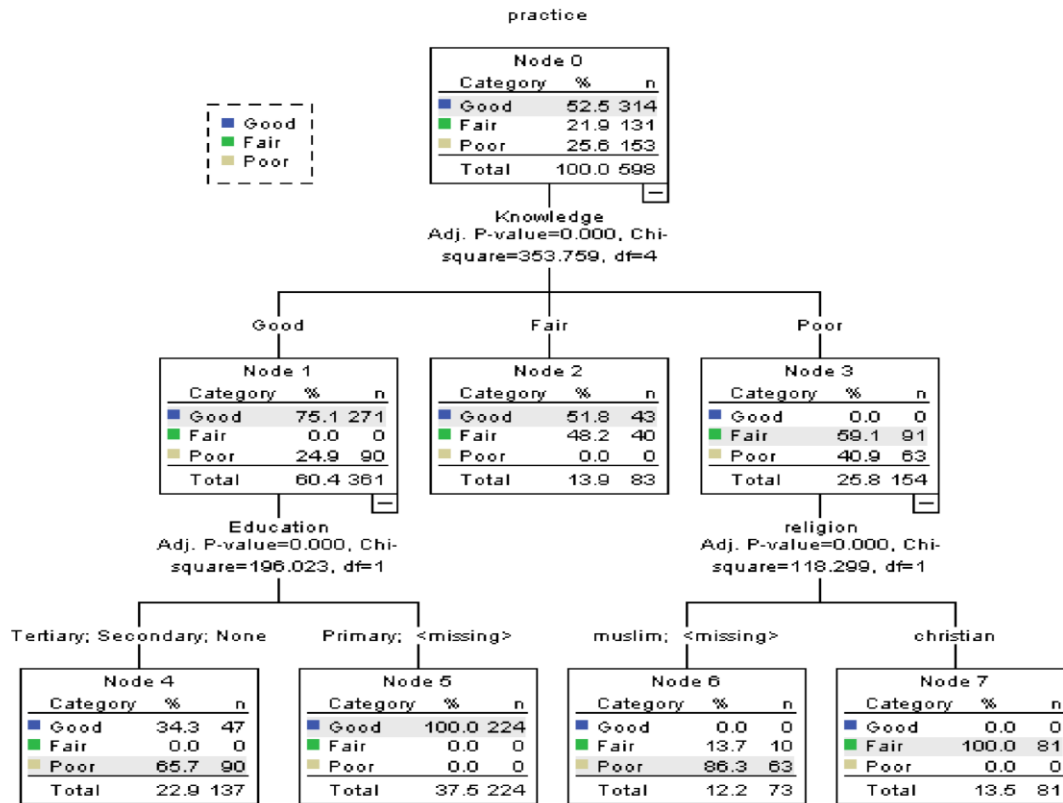
**Table 3:** Classification matrix for attitude of type 2 diabetes patient

**Figure 3** shows the CHAID decision tree result for practice of type 2 diabetes patient. This shows how knowledge, education and religion affect the level of practice of the patient. Knowledge has the most significant effect on the patient which means that it is most strongly associated with practice (dependent variable) and has more power in the classification of attribute into groups ( $\chi^2=353.759$  df=4, p value =0.000.). This variable split into 3 nodes (node1, node2, and node 3). The knowledge divisions are as follows: 60.4% of patient with good knowledge has good practice of 75.1% and poor practice of 24.9, 13.9% of patient with fair knowledge has good practice of 51.8% and fair practice of 48.2% and 25.8% of patient with poor knowledge has fair practice of 59.1% and poor practice of 40.9%.

Node 1 split into node 4 and node5. With patient with good knowledge, there is an association between education of the patient and the level of practice. Of 60.4% patient with good knowledge, 22.9% of patient with tertiary and secondary education has good practice of 34.3% and poor practice of 65.9%, also 37.5% of patient with primary education has good practice of 100%. Node 3 split into node 6 and node 7. Among patient with poor knowledge, there is an association between religion and level of practice. Of 25.8% patient with poor knowledge, 12.2% of patient are Muslims and has poor practice of 86.3% and 13.7% fair knowledge, 13.5% of patients are Christians and has fair practice of 100%.

The result of the CHAID analysis shows that 52.5% of diabetes patient has good practice, 21.9% has fair practice and 25.6% has poor practice. The result is in contrast with the research carried out in Umuaia (Odenigbo et al., 2012). The study shows that the practices of type 2 diabetes mellitus are affected by knowledge, education and religion. However, the most determinant is knowledge. According to this study: patient with good knowledge has good practice of 75.1% and poor

practice of 24.9%, patient with fair knowledge has good practice of 51.8% and fair practice of 48.2%, and patient with poor knowledge has poor practice of 40.9% and fair knowledge of 59.1%. Patient who has good knowledge with secondary and tertiary education has good attitude of 34.3% and poor attitude of 65.7%. Also, patient with poor knowledge and are Muslims have poor practice of 86.3% and fair practice of 13.7% and patient who are Christians have fair knowledge.



**Figure 3:** CHAID Decision tree class for practice of type 2 diabetes patient

**Table 4** represents classification matrix containing, by categories of the dependent variables i.e. the predicted classification. It is stated that the overall accuracy of the model is 83.8%. However, the percentage structure of modeled (predicted) values according to the categories of the dependent variable (51.3%.13.5%, 35.1% is not significantly different from that of the original data (52.5%, 21.9%, 25.6%).

Observed	Good	Fair	poor	% correct
Good	264	0	47	85.0
Fair	40	81	10	61.8
Poor	0	0	153	100.0
Overall (%)	51.3	13.5	35.1	83.8

**Table 4:** Classification matrixes for type 2 diabetes patient

**Conclusion**

This study revealed that individual with type 2 diabetes mellitus in Nigeria had good knowledge of 59.5%, poor knowledge of 31.1% and fair

knowledge of 9.5%, also this study shows that 47% of diabetes mellitus patient had good attitude, 8.6% had fair attitude, and 44.4% had poor

attitude of the ailment. This indicated their level of compliance to the ailment. Also, the study also shows that 52.5% of type 2 diabetes mellitus had good practice, 21.9% had fair practice and 25.6% had poor practice. This indicated their level of management of type 2 diabetes. Therefore, this study shows that most of the patient had good knowledge of the ailment. Nevertheless, there is a need to educate patient on issues relating to diabetes mellitus and ensure compliance to the interventions needed in the management of type 2 diabetes mellitus. In this study, a socio demographic characteristic of the patient has been revealed to have a role in the knowledge, attitude and practice of type 2 diabetes patient. It is found out that status is the major determinant of knowledge in type 2 diabetes patient also education is the major determinant of attitude in type 2 diabetes patient and knowledge is the major determinant of practice in type 2 diabetes patient. This will help in implementing education programs and necessary awareness in the management of type 2 diabetes and providing patient the right information on the factors associated with knowledge, attitude and practice. The strength of this study is that it is the first to use data mining in assessing the knowledge, attitude and practice of adult patient living with type 2 diabetes mellitus in Nigeria. Also this study considers socio demographic characteristics as a risk factor for type 2 diabetes mellitus. This research has certain limitation, most studies are focused majorly on the knowledge of type 2 diabetes patient and less work has been done on the attitude and practice of patient with type 2 diabetes mellitus. Moreover, this study does not cover all the state in Nigeria.

## References

- American Diabetes Association (2004). Nutrition principles and recommendations in diabetes
- American Diabetes Association. (2002). Standards of medical care for patients with diabetes mellitus. *Diabetes Care*, 25(Suppl.), S33-S49
- Baba, M.M., Fabian, H.P., Ibrahim, D.G., Musa, M.B., (2018). Prevalance and Risk Factors for Diabetes Mellitus in Nigeria: A Systematic Review and Meta-Analysis.
- Chukwuma M (2012). Bitter leaf, Scent leaf extract protects Diabetics from Heart, Testicular Damage. *Guardian*. 19 July, 2012.
- Finucane, M. M, Stevens G A, Cowan M J, Fanatic G et al (2011). National, regional and global trends in body mass index since 1980: Systematic analysis of health examination surveys and epidemiological studies with 960 country years and 9.1 million participants. 2011; 377(9765): 558-567.
- Gulcin Yıldırım E, Karahoca A, Ucar T. (2011) Dosage planning for diabetes patients using data mining methods. *Procedia Computer Science*.;3:1374-80.
- Gulcin Yıldırım E, Karahoca A, Ucar T. (2011) Dosage planning for diabetes patients using data Mining methods. *Procedia Computer Science*.;3:1374-80.
- International Diabetes Federation (IDF). *Diabetes Atlas*, 7th ed; International Diabetes Federation:Brussels Belgium.
- Maitra, A., Abbas, A.K. (2005). Endocrine system. In: Kumar V, Fausto N, Abbas AK (eds). *Robbins and Cotran Pathologic basis of disease* (7th ed) . Philadelphia, Saunders; 1156-1226.
- Samuel O. A. (2014). *Diabetes Knowledge, Health Belief, and Diabetes Management Among the Igalaa, Nigeria*.
- Sohail. MN., Ren Jiadong., Uba, M.M., Irshad MI., Musavir Bilal. Abir, SI., Waslim Iqbal (2018). A pilot study on inadequacy and domination of data mining technology. *International Journal of recent scientific Research*. Vol 9, issue 10(8).
- Vankudrr AJ, Padhyegurjar MS, Gladys H J (2013). A study to assess awareness regarding Diabetes Mellitus and factors affecting it in a tertiary care hospital in Kancheepurum District *Health line Journal*; 4(2): 44-49.
- Idongesit L.J, Maxwell O.A, Mattew J. O, Chinwe V.U.(2014). Knowledge of self- care among type 2 diabetes patient in two states of Nigeria. *Pharm pract*. 12(3); 404.
- Funmilola, I.O, Fredrick O, Christy E.U, Ademola L. A. (2017). Knowledge and factors associated with treatment compliance among Diabetes Mellitus Patients in selected Hospitals in Ibadan, Oyo state, Nigeria; *Journal of Advance in Medicine and Medical research*. 23(7):1-8. Article no. JAMMR 35670: ISSN: 2456-8899.
- Faith, O. A and Olayinka S. I. (2014). Knowledge and attitude of a semi urban Community in the South-South Region of Nigeria towards Diabetes Mellitus. *American Journal of Public Health Research*. Vol. 2 No 3, 81-85.
- Samuel O. A. (2014). *Diabetes Knowledge, Health Belief, and Diabetes Management Among the Igalaa, Nigeria*.
- Olatona F.A, Airede C.A, Aderibigbe S.A, Osibogun, A. (2019). Nutrition knowledge, Dietary Habits and Nutritional Status of Diabetic Patients Attending Teaching Hospitals in Lagos, Nigeria. *Journal of Community Medicine and primary health care*. 31(2).90-103.





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