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# Non-adherence to selected self-care actions and its determinants among adults with type 2 diabetes mellitus in a tertiary hospital in Enugu State Nigeria

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The study determined the prevalence of non-adherence to medication, self monitoring of blood glucose (SMBG), clinic visits and the associated factors among out-patient type 2 adult diabetics at a tertiary hospital in Enugu State Nigeria. Using a descriptive cross-sectional design, 200 patients was purposively selected. Researcher-developed questionnaire was tool for data collection. Analysis was done in proportions, percentages and logistic regression (alpha level was P=0.05). Respondents' mean age was 60.1±10.6; 88% were married and females were 63.5%. Overall prevalence of non adherence to drugs was 24.5%; that varied from 26.9 to 11.8% depending on drug combinations. Majority (57.5%) of the respondents had no glucometer for SMBG at home; 86.1% on oral hypoglycaemic agents did not monitor their blood glucose level 2-3 times weekly; 78.9% on injection insulin combined with tablets did not monitor their blood glucose level at least once daily. Non-adherents to clinic visits were 49.0%. Age <50 years (P= 0.006) and being married (P= 0.025) were associated with drug non-adherence. Cost of transportation (P= 0.000), discouraging attitudes of health workers (P= 0.003) and late commencement of clinic activities (P= 0.006) were associated with clinic visit non-adherence. There was non adherence to diverse self care activities among diabetic patients in this study therefore factors that contribute to non adherence should be addressed by healthcare providers.

**Key words:** Non-adherence, self-care actions, diabetic management regimen, adults with type 2 diabetes.

## INTRODUCTION

Non adherence to prescribed therapies is a costly problem in the care of patients especially those with chronic illnesses such as diabetes mellitus. Failure of a patient to adhere to recommended therapies leads to poorer health outcomes and increased healthcare costs. Non adherence to diabetic management regimen is possibly the most common reason for poor health outcomes among diabetic patients (Mumu et al., 2014; Kassahun et al., 2016; Dehdari and Dehdari, 2019).

Diabetes mellitus (DM) herein-after referred to as diabetes is a group of metabolic diseases characterized by hyperglycaemia resulting from defects in insulin

secretion, insulin action, or both (Hinkle and Cheever, 2014). These defects result to deficient action of insulin on target tissues affecting carbohydrate, fat, and protein metabolism adversely. Complications of diabetes include acute life threatening consequences, long-term damages and dysfunction of different organs especially the eye, kidneys, nerves, heart and blood vessels. Type 2 diabetes accounts for more than 90–95% of diabetics, and includes individuals who have insulin resistance (American Diabetes Association, 2013; Adisa and Fakeye, 2014).

Diabetes is rapidly spreading worldwide and estimates by the International Diabetes Federation (IDF) (2017) suggest that the number of adults with diabetes in the world will expand by 54%, from 284.6 million in 2010 to 438.4 million by 2030. The projected growth for sub-Saharan Africa is 98%, from 12.1 million in 2010 to 23.9 million in 2030. Nigeria is reported to have more than 7% of its population as diabetics out of which more than 95% were type 2.

The risk of developing type 2 diabetes increases with age, obesity, history of pre diabetes, family history and lack of physical activity. Some of these risk factors are modifiable by self-care actions like taking drugs, self monitoring of blood glucose (SMBG), regular exercise, dietary modification, stress management, foot and eye care. Thus diabetes is a self-managed disease that requires patients to have a degree of autonomy and motivation to successfully perform self-care diabetes management activities. However regimen adherence problems are common in individuals with diabetes, making glycaemic control difficult to attain (Uloko et al., 2018). A study using a large national sample of patients with type 2 diabetes found that 24% of insulin-treated patients, 65% of those on oral medications, and 80% of those treated by diet and exercise either never performed SMBG or did so less than once per month (Delamater, 2006, Hu et al., 2017). Daily SMBG (at least one blood glucose check per day) was reported by only 39% of patients treated with insulin and just 5% of those treated with either oral medications or diet and exercise.

Non adherence and non-compliance has been defined and used interchangeably. While noncompliance was defined as "the failure or refusal of a patient to cooperate by carrying out that portion of a medical care plan under his or her control," non adherence was defined as "failure to adhere to a treatment plan or to follow a regimen in a consistent manner" (Hinkle and Cheever, 2014) and the extent which the person's behaviour for taking medication, following diet, or executing lifestyle changes, coincides with medical advice. The concept of non compliance reinforces the dominance and paternalism of the medical model which implies professional power over patients. Hence, patients are seen to be irrational and wilfully fail to observe instructions. However this study assumes that though diabetics may gain knowledge through health talks at the clinic about the benefits of their needed lifestyle changes and treatment yet they may be prevented from adhering by multiple factors (Berman et al., 2010). Therefore, in this study non-adherence has been preferred over non compliance.

Despite efforts to make a meticulous diagnosis and provide evidenced-based care, if a patient does not adhere to prescribed regimen, the treatment goal may not be met. Diabetes is incurable but with strict adherence to medication, informed dietary modification, appropriate physical exercise, regular follow-up appointments and other self-care activities, good glycaemic control can be maintained (Bagonza et al., 2015).

Many diabetic patients fail to adhere to their regimen for reasons, which may include forgetfulness, poor understanding of the nature of their disease, high cost of regimen and traditional beliefs about the disease. Other associated factors to non-adherence were noted as depression and diabetes related-emotional distress, fear of pricking self for SMBG, appointments that do not begin on time, poor provider-patient relationship, unpleasantness of regimen, complicating everyday life and fear of hypoglycaemia (Almaghaslah et al., 2018).

Researchers have found medication and life style adherence problems among diabetics most of which were done in developed countries. Most studies from developing countries like Nigeria either assessed medication non adherence alone or did it with samples that included both type1 and type 2 diabetics with paucity of information on studies assessing non adherence to other management regimens such as SMBG, and follow-up clinic visits among type 2 diabetic patients and factors that may be contributing to it. In Enugu there were few studies on adherence to antidiabetic drugs but none measured non adherence to other self-care activities like self-monitoring of blood glucose and clinic follow up visits ((Hüther et al., 2013; Ogbonna et al., 2015).

This underscores the need for this study which assessed the prevalence of non adherence to prescribed medications, SMBG, attending follow-up clinic appointments and their associated factors among out-patient adult type 2 diabetics in a tertiary hospital in Enugu State Nigeria.

## MATERIALS AND METHODS

This descriptive cross-sectional study was done in a tertiary hospital in Enugu, Nigeria with in-patient facilities where patients could be hospitalized and runs an outpatient diabetic clinic once every week. From a target population of 360 adults with type 2 diabetes registered in one year, a sample size of 200 was computed using Taro Yamane formula for finite population while those who met the under-listed criteria were purposively selected for the study. Patient must have been diagnosed as type 2 diabetic, registered and attending diabetic clinics; up to 40 years old; coherent in speech; alert, and available during the time of data collection between October and December 2010.

Researcher - designed questionnaire was the tool used for data collection. The questionnaire consists of 20 items that elicited respondents' demographic variables; non adherence to medication, self monitoring of blood glucose and keeping clinic appointments

and factors associated with non-adherence. The questionnaire was pilot tested through test retest method among 20 diabetic patients attending a peripheral diabetic clinic manned by a Consultant Physician within two weeks interval and reliability coefficient yielded 0.9.

Prior to data collection, ethical and administrative permit were obtained from the research Ethics Committee of the hospital and the administrative authorities respectively. The verbal consent of the respondents was solicited for and obtained. Anonymity was also maintained to enhance confidentiality. Patients were assured that they were free to opt out of the study without any trait of denial of conventional care.

Data collected were analysed using a Statistical Software Package for Social Sciences (SPSS) version 15. Data proportions were computed for general descriptive statistics. Inferential statistics using logistic regression was performed to determine variables significantly associated with non-adherence at $P \leq 0.05$ level of significance. Odd ratios, their 95% confidence intervals and p-values were all computed.

Drug non-adherence in this study was operationally defined as an adult with type 2 diabetes not taking up to 80% of the prescribed dose of injection insulin or oral hypoglycaemic agents (OHA). This was calculated as: No of drugs taken ∕ No of drugs prescribed × 100 ∕ 1(Kassahun et al 2016). Non adherence to self-monitoring of blood glucose entails not having any meter for measuring blood glucose level at home; not measuring blood glucose level every other day or at least twice in a week for those on oral hypoglycaemic agent (OHA) and before each meal or at least daily for those on injection insulin (Hinkle and Cheever, 2014). Non adherence to follow up clinic visit entailed patients not keeping to more than one clinic appointments as booked in a month.

## RESULTS

Respondents' characteristics (Table 1): their mean age was 60.1(± 10.7) years, while more than half (111 =55.5%) were above 60 years of age. They were more females (63.5%) than males (36.5%); few (29%) had no formal education, while majority (71%) had at least primary education. Most (88%) of the respondents were currently married. The mean duration with diabetes since diagnosis was 7.4 years. Respondents were mostly self-employed traders (39.5%) and 12% farmers, while 63 (31.5%) were pensioners. Majority of the respondents (87.5%) were on oral hypoglycaemic agents (OHA), 13 (6.5%) were on combined OHA and injection insulin, while 12 (6%) were on injection insulin only.

Fifty five (55 = 24.5%) of the respondents did not take up to 80% of their prescribed medication, while 49 (25.8%) on tablet Metformin / Glucophage, 39 (26.9%) on Glibenclamide/ Daonil, and two (11.8%) on injection soluble insulin did not adhere to the prescribed medications. Up to 115 (57.5%) did not have glucometer for self-monitoring of blood glucose at home while 155 (86.1%) of those who were on oral hypoglycaemic agents (OHA) failed to monitor their blood glucose level at least 2-3 times in a week. Those on injection insulin combined with OHA that did not monitor their blood glucose level at least once daily were 15 (78.9%) and ninety eight (98=49.0%) of the respondents did not attend their follow up clinic visits as booked (Table 2).

Logistic regression analysis showed that only age (P 0.006, OR 0.118, CI = 0.025 - 0.544) and marital status (P 0.025, OR = 5.678, 95% CI = 1.250 - 25.792) were the demographic factors that were significantly associated with non-adherence to medication while gender, level of education, occupation and duration with diabetes were not associated with non-adherence to medication. No demographic factors were significantly associated with non-adherence to clinic visits and self-monitoring of blood glucose (SMBG) (Tables 3A, B and C).

Table 4 shows that no psychosocial factor was found to be significantly associated with non-adherence to medication. However, 31 (15.5%) of the respondents reported that cost/financial constraint contributed to their non-adherence to medication while 26 (13.0%) agreed that forgetfulness contributed to theirs. Cost of transportation (P 0.000 OR = 0.181, 95% CI =0.069-0.472) and no family member available to accompany respondents (P0.024 OR = 0.088, 95% CI =0.011 - 0.723) were found to be significantly associated with non-adherence to keeping clinic visits. No psychosocial factor was found to be significantly associated with non-adherence to SMBG since majority (119 =59.5%) did not have any device for self-monitoring at home though fourteen (14 =7.0%) of those who had meters agreed that fear of pricking self-contributed to their non-adherent behaviour.

No health system/regimen related factor was associated with non-adherence to medication and SMBG however; discouraging attitude of the health workers (P 0.003 OR = 0.046, CI=0.006 –0.0353,) and late commencement of clinic activities (P 0.006, OR= 0.057, C I= 0.007 – 0.0448) were found to be significantly associated with non-adherence to keeping clinic appointments as seen in (Table 5).

## DISCUSSION

Majority of the respondents were females (63.5%) while 36.5% were males. Similar findings were reported in other studies and may be explained by the fact that females have the tendency to report illness more than males.

Moreover women are being motivated to give more attention to their lifestyle modifications and self-care practices through the media and social media resulting in women taking greater responsibility for their own health care and health care options (Hinkle and Cheever, 2014; Almaghaslah et al., 2018).

Majority of the respondents (55.5%) were above 60 years of age. Although diabetes can appear earlier in younger adults as a result of obesity and physical inactivity, Type 2 diabetes typically develops in adults over the ages of 40 years (ADA, 2013). More than half of the respondents, (87.5%) were treated with only oral hypoglycaemic agents (OHA) while only 6.5% were

**Table 1.** Demographic characteristics of respondents. (n=200).

| Variable | Frequency | Percentage  % |
|---|---|---|
| **Sex** | | |
| Males | 73 | 36.5 |
| Females | 127 | 63.5 |
| | | |
| **Age** | | |
| 40 – 49 | 31 | |
| 50 – 59 | 58 | 15.5 |
| ≥60 | 111 | 29.0 |
| | | |
| **Level of education** | | 55.5 |
| No formal education | 58 | 29.0 |
| Primary | 85 | 42.5 |
| Secondary | 21 | 10.5 |
| Tertiary | 36 | 18.0 |
| | | |
| **Marital status** | | |
| Single | 4 | 2.0 |
| Married | 176 | 88.0 |
| Divorced | 5 | 2.5 |
| Widowed | 15 | 7.5 |
| | | |
| **Duration of diabetes** | | |
| ≤ 5years | 70 | 35.0 |
| 6 – 10years | 79 | 39.5 |
| ≥ **11**years | 51 | 25.5 |
| | | |
| **Occupation: Group** | | |
| **Self-employed** | **105** | 52.5 |
| Farming | 24 | 12 |
| Trading | 79 | 39.5 |
| Pastors | 2 | 1.0 |
| | | |
| **Employed in a salaried job** | **23** | 11.5 |
| Hospital  cleaners | 5 | 2.5 |
| Banking | 2 | 1.0 |
| Security men | 2 | 1.0 |
| Navy officer | 1 | 0.5 |
| Office clerk | 3 | 1.5 |
| Teaching | 4 | 2.0 |
| Administrative officers | 6 | 3.0 |
| | | |
| **Unemployed/retirees** | 72 | 36 |
| Pensioners | 63 | 31.5 |
| Unemployed | 9 | 4.5 |
| | | |
| **Diabetes treatment options:** | | |
| Injection insulin | 12 | 6.0 |
| Oral hypoglycemic agent | 175 | 87.5 |
| Injection insulin and tablets | 13 | 6.5 |

receiving OHA combined with insulin injection. Oral hypoglycaemic agent has been found effective in treating patients with  type 2 diabetes where diet and exercise alone were not sufficient (Hinkle and Cheever, 2014). However injection insulin may be needed to control blood glucose level in patients with type 2  diabetes during

**Table 2.** Prevalence of non-adherence to Medication, SMBG and Follow up clinic visit.

| Medication behavior | Frequency | Percentage % |
|---|---|---|
| ≥80% intake of drugs = adherence | 145 | 75.5 |
| <80% intake of drugs = non adherence | 55 | 24.5 |
| **Non adherence according to drug type:** | | |
| Metformin (Glucophage), n =190 | 49 | 25.8 |
| Glibenclamide (Daonil), n =145 | 39 | 26.9 |
| Injection insulin, n=17 | 2 | 11.8 |
| **SMBG** | | |
| Not having glucometer = non adherence | 115 | 57.5 |
| 2-3 times daily check for those on OHA = adherence | 25 | 13.9 |
| <2-3times daily check for those on OHA = non adherence | 155 | 86.1 |
| ≥1 daily check for those on inj. Insulin = adherence | 4 | 21.1 |
| <1 daily check for those on inj. Insulin = non adherence | 15 | 78.9 |
| **Adherence behavior for clinic visits** | | |
| Able to come for clinic visit=adherence | 102 | 51 |
| Not able to come for clinic visit =non adherence | 98 | 49 |

**Table 3A.** Association between demographic factors and non adherence to Medication. n=200.

| Variable medication | Non adherence | | Odds ratio | 95% C.I | p-value |
|---|---|---|---|---|---|
| | Yes (n, %) | No (n, %) | | | |
| **Sex** | | | | | |
| Male | 16 (29.1%) | 57 (39.3%) | 1.919 | 0.932 – 3.953 | 0.077 |
| Female | 39 (70.9) | 88 (60.7) | | | |
| **Age** | | | | | |
| < 50 years | 53 (96.4) | 116 (80) | 0.118 | 0.025 -0.544 | **0.006**** |
| ≥50 years | 2 (3.6) | 29 (20) | | | |
| **Level of education** | | | | | |
| None Or Primary | 40 (72.7) | 103 (71) | 1.138 | 0.530 -2.444 | 0.740 |
| Secondary/Tertiary | 15 (27.3) | 42 (29) | | | |
| **Marital status** | | | | | |
| Single | 2 (3.6) | 22 (15.2) | 5.678 | 1.250 -25.792 | **0.025**** |
| Married | 53 (96.4) | 123 (84.8) | | | |
| **Occupation** | | | | | |
| Unemployed | 18 (32.7) | 46 (31.7) | 0.982 | 0.472 -2.042 | 0.962 |
| Employed | 37 (67.3) | 99 (68.3) | | | |
| **Duration with diabetes** | | | | | |
| ≤4yrs | 23 (41.8) | 47(32.4) | 0.610 | 0.306-1.218 | 0.161 |
| >4yr | 32 (58.2) | 98 (67.6) | | | |

** significant association at *p* value ≤ 0.05.

illness, infection, pregnancy, surgery or drug related factors/tolerance.

The prevalence of non adherence to medication in this study which was 24.5% is lower but close to other findings (Almaghaslah et al., 2018; Kassahun et al., 2016) that recorded a prevalence of 38 and 31.2% respectively. Other researchers recorded higher prevalence rate of 47.1 and 64.4% in their studies (Adisa and Fakeye, 2014, John et al., 2005). Determining the degree of patient adherence to medication can be

**Table 3B**: Association between demographic factors and non adherence to follow up clinic visit. n=200

| Follow up clinic visit | Non adherence | | Odds Ratio | 95% C.I | p-value |
|---|---|---|---|---|---|
| | Yes (n, %) | No (n, %) | | | |
| **Sex** | | | | | |
| Male | 33 (33.7%) | 40 (39.2%) | 1.400 | 0.768-2.552 | 0.272 |
| Female | 65  (66.3) | 62 (60.8) | | | |
| | | | | | |
| **Age** | | | | | |
| < 50years | 83  (84.7) | 86 (84.3) | 1.071 | 0.476-2.409 | 0.868 |
| ≥50years | 15  (15.3) | 16 (15.7) | | | |
| | | | | | |
| **Level of education** | | | | | |
| None or primary | 71  (72.4) | 72 (70.6) | 0.928 | 0.487-1.771 | 0.822 |
| Secondary or tertiary | 27  (27.6) | 30 (29.4) | | | |
| | | | | | |
| **Marital status** | | | | | |
| Single | 11  (11.2) | 13 (12.7) | 1.137 | 0.476-2.718 | 0.772 |
| Married | 87  (88.8) | 89 (87.3) | | | |
| Occupation | | | | | |
| Unemployed | 34  (34.7) | 30 (29.4) | 0.772 | 0.409-1.459 | 0.426 |
| Employed | 64  (65.3) | 72 (70.6) | | | |
| | | | | | |
| **Duration with diabetes** | | | | | |
| **≤4years** | 29  (29.6) | 41(40.2) | 1.601 | 0.875-2.929 | 0.127 |
| **≥4 years** | 69  (70.4) | 61(59.8) | | | |

** Shows significant association at *p* value ≤ 0.05.

**Table 3C.** Association between demographic factors and non-adherence to SMBG n=200.

| SMBG | Non adherence | | Odds Ratio | 95% C.I | p-value |
|---|---|---|---|---|---|
| | Yes (n, %) | No (n, %) | | | |
| **Sex** | | | | | |
| Male | 40 (34.8%) | 33 (38.8%) | 1.358 | 0.738-2.500 | 0.326 |
| Female | 75  (65.2) | 52  (61.2) | | | |
| | | | | | |
| **Age** | | | | | |
| <50years | 94  (81.7) | 75  (88.2) | 1.679 | 0.710-3.972 | 0.238 |
| ≥50years | 21  (18.3) | 10  (11.8) | | | |
| | | | | | |
| **Level of education** | | | | | |
| None Or Primary | 77  (67.0) | 66  (77.6) | 1.687 | 0.858-3.318 | 0.129 |
| Secondary or Tertiary | 38  (33.0) | 19  (22.4) | | | |
| | | | | | |
| **Marital status** | | | | | |
| Single | 12  (10.4) | 12  (14.1) | 1.327 | 0.556-3.168 | 0.523 |
| Married | 103 (89.6) | 73  (85.9) | | | |
| Occupation | | | | | |
| Unemployed | 39  (33.9) | 25  (29.4) | 0.820 | 0.428-1.571 | 0.550 |
| Employed | 76  (66.1) | 60  (70.6) | | | |
| | | | | | |
| **Duration with diabetes** | | | | | |
| 0-4yrs | 35  (30.4) | 35  (41.2) | 0.727 | 0.935-3.190 | 0.081 |
| >4yrs | 80  (69.6) | 50  (58.8) | | | |

**Shows significant association at *p* value ≤ 0.05.

**Table 4.** Association between psychosocial factors and non-adherence to medication, self-monitoring of blood glucose (SMBG) and follow up clinic visit (n=200).

| Medication | Non adherence | | Odds ratio | 95% CI | p-value |
|---|---|---|---|---|---|
| | Yes (n, %) | No (n, %) | | | |
| Inability to replace drugs due to cost/financial problem | 31 (15.5) | 169 (84.5) | 1.410. | 0.564-3.522 | 0.462 |
| Forgetfulness | 26 (13.0) | 174 (87.0) | 1.851 | 0.648-5.291 | 0.250 |
| Fear of drug side effect | 19 (9.5) | 181 (90.5) | 1.560 | 0.485-5.014 | 0.456 |
| Drug seems not to be working | 9 (4.5) | 191 (95.5) | 1.273 | 0.257-6.462 | 0.770 |
| When fasting | 12 (6.0) | 188 (94.0) | 0.705 | 0.195-2.543 | 0.593 |
| Frustration due to long duration of treatment | 16 (8.0) | 184 (92.0) | 1.226 | 0.369-4.078 | 0.739 |
| **Follow up clinic visit** | | | | | |
| Distance is much | 15 (7.5) | 185 (92.5) | 0.519 | 0.144-1.868 | 0.315 |
| Could not due to cost of transport | 31 (15.5) | 169 (84.5) | 0.181 | 0.069 –0.047 | 0.000** |
| Nobody to accompany | 9 (4.5) | 191 (95.5) | 0.088 | 0.011- 0.723 | 0.024** |
| **Self-monitoring of blood glucose** | | | | | |
| Do not have any meter | 119 (59.5) | 81 (40.5) | 1.733 | 0.914-3.284 | 0.092 |
| Have meter but cannot use it | 5 (2.5) | 195 (97.5) | .009 | 0.000 | 0.999 |
| Fear of pricking myself | 14 (7.0) | 186 (93.0 | .759 | 0.218-2.647 | 0.666 |

**Shows statistically significant.

**Table 5.** Association between health system/regimen factors and non adherence to medication, SMBG and coming for clinic visits.

| Medication | Non adherence | | Odds Ratio | 95% CI | P-value |
|---|---|---|---|---|---|
| | Yes (n, %) | No (n, %) | | | |
| Fear of pricking myself | 9 (4.5%) | 191(95.5%) | 0.008 | 0.000 | 0.999 |
| Difficulty with drawing correct dose | 2 (1.0) | 198 (99.0) | 0.951 | 0.000 | 1.000 |
| Fear of hypoglycaemia | 9 (4.5) | 191 (95.5) | 3.413 | 0.415-28.051 | 0.253 |
| Believes drug may not help | 11 (5.5) | 189 (94.5) | 1.278 | 0.250-6.546 | 0.768 |
| When blood sugar is high or low | 18 (9.0) | 182 (91.0) | 1.010 | 0.338-3.022 | 0.986 |
| **Coming for check ups** | | | | | |
| Attitude of health workers is discouraging | 18 (9.0) | 182 (91.0) | 0.046 | 0.006-0.353 | 0.003** |
| Clinic activities are not commenced on time | 15 (7.5) | 185 (92.5) | 0.057 | 0.007-0.448 | 0.006** |
| **SMBG** | | | | | |
| Difficulty reading and interpreting result | 4 (2) | 186 (98) | 1.361 | 0.188-9.864 | 0.760 |
| Fear of pricking myself | 14 (7.0) | 186 (93.0 | 0.759 | 0.218-2.647 | 0.666 |

**Statistically significant factors at p value = 0.05.

gathered from the patient, physician, pharmacist, family members and friends' reports, however, self-reports are often inaccurate because patients may lie to avoid displeasing their healthcare provider or they may not only under report poor adherence but also over report good adherence (Almaghaslah et al., 2018). This may account for the varying reports of non adherence to medication in this study and other studies where self reports were obtained directly from the respondents through answering questionnaires.

In this study, 49% of the respondents missed more than one booked follow up visits. Other studies (Fredrick and Justin-Temu, 2012) recorded 28.3% non adherence to keeping hospital appointments in patients with diabetes. Lower adherence rates to clinic visits as seen in this study and recorded in other studies can occur when patients rate their patient-provider communication as poor and appointments were not commenced on time or due to far distance of clinic from patient's residence (Kassahun et al., 2016). About 32% of the respondents

were non-adherent to SMBG while 57.5% of the respondents did not have any device (glucometer) for SMBG at home. Other studies (Mogre et al., 2017) also recorded about 2.6 and 32% non-adherences to self blood glucose monitoring Survival skills are essential for patients with diabetes and ability to monitor blood glucose level at home is part of this skill (Canadian Diabetes Association, 2014). Self monitoring of blood glucose helps patients and providers to identify trends in glycaemia control so that changes can be made in meal plan, medication and exercise. In this study, where majority of the respondents did not have any glucometer for blood glucose check at home and few reported that they go to nearby laboratory facility or community health centre for monitoring but only when they feel sick, these behaviours challenge their survival skills and make them not to monitor their blood glucose level as expected.

Age (P 0.006, C I 0.025 – 0.544 OR 0.118) and marital status (P 0.025, C.I; 1.250 -25.792 OR 5.678) were significantly associated with non adherence to medication in this study and those <50 years (96.4%) were more non adherent to medication than those who were ≥50 years (3.6%). This may be possible because people that are less than 50 years may be more actively involved in work and other social activities outside the home, and this may impact on their adherence behaviour negatively. Furthermore, adults are more likely to either forget taking their drugs or take it in un-prescribed way especially when they have more than one prescription to follow (Awodele and Osuolale, 2015; Almaghaslah et al., 2018).

Married respondents were more non adherent to medication than the singles in this study. This may possibly be due to the fact that married people are more likely to have distractions from family issues that may militate against adherence more than the singles and more so married respondents were on the majority in this study than the singles. However, this finding is in contrast with the findings of other researchers (Bagonza et al., 2015), where marital status and age were not significantly associated with non adherence to medication in Uganda though the study participants in the study included those from 18 years and above and who were not married. None of the demographic factors were found to be significantly associated with non adherence to coming for clinic visit in this study but non-adherents were more of the less educated, females, persons aged 50 years or below and the employed.

Cost of transportation (P 0.000, C I 0.69 - 0.472 OR 0.181) showed significant association with non adherence to clinic visits. The permanent site of the teaching hospital of study was relocated outside the centre of the town making transportation to the hospital a challenge for patients within and outside the state. This agrees with findings in Kassahun et al. (2016) where distance to clinic, transportation difficulties, financial constraints and poverty impacted adherence to attending clinic visits among type 2 diabetics in their study.

Non availability of family members to accompany respondents (P 0.024, CI 0.011–0.723, OR 0.088) was significantly associated with non adherence to keeping clinic follow up visits. Most of the respondents (55.5%) were above 60 years and may have challenges with remembering multiple instructions from physician, dietician and pharmacists. Older adults may experience confusion with complex tasks such as remembering details of health talks and instructions concerning their medications thus may need family member assistance. This is similar to the findings by Awodele and Osuolale (2015) who reported that family support/involvement were significant factors to adherence in adults with type 2 diabetes in their study.

Starting clinic activities late (P 0.006, CI 0.007–0.448, OR 0.057) and discouraging attitude of healthcare providers (P 0.003, CI 0.006–0.353, OR 0.046) were significantly associated with non adherence to keeping clinic visits. Therapeutic patient-provider relationship enhances adherence and lack of it accounts for non adherence. Waiting hours before receiving care gets prolonged when clinic activities are commenced late and can lead to distress and difficulties in getting home late. This report supports that of Polonsky and Henry (2016), Freeman-Hildreth et al. (2019); who stated that patients with type 2 diabetes who had better relationship with their providers reported good glucose control with less diabetes distress. Patients' satisfaction with care and support from healthcare providers has been identified by (Chandra et al., 2018) as factors in improving and maintaining good adherence to medical regimen.

## Recommendations

Chronic illness often requires complicated treatment regimen for lengthy periods and its clinical implication is that healthcare providers (physicians, nurses, pharmacists etc) should understand that non adherent behavior in persons with diabetes are influenced by multifaceted factors. Improved communication (through phone calls, text messages and reminders) and patient provider relationship could enhance patients' satisfaction and improve patients' self care behaviours. Efforts should be made to reduce waiting time by managing time better.

## Limitations to the study

There was paucity of local studies on non adherence to these dimensions of non adherence to diabetic management regimen in Nigeria, most the literature concentrated only on medication adherence. The study was hospital based where patients are already accessing health facility therefore community- based study with clients who could not access health facilities may give the true picture of non adherence and its associated factors.

## Conclusion

There was non-adherence to management regimen in adults with type 2 diabetes and age, marital status, cost of transportation, lack of family member to accompany them, discouraging attitude of health workers and late commencement of clinic activities were significantly associated with non adherence in this study. Healthcare providers should look out for non adherence in their patients and ensure that the client with diabetes understands the necessary instructions and is able to perform the prescribed therapy.

## CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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