# Level of Medication Adherence and Associated Factors Among Patients with Type 2 Diabetes Mellitus at Cebu South Medical Center Family Medicine Outpatient Clinic: A Cross-sectional Study

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**Background**: Diabetes mellitus type 2 (T2DM) is one of the leading chronic conditions that greatly impacts Filipino families. Medication non-adherence is a significant challenge in achieving optimal treatment outcomes for individuals with this condition.
**Objective**: This study determined the level of medication adherence and explored the associated factors contributing to non-adherence among patients with T2DM at Cebu South Medical Center (CSMC) Family Medicine outpatient clinic.
**Method**: A cross-sectional study was done in CSMC Family Medicine outpatient clinic from August to October 2023. A self-administered questionnaire divided into three domains of non-adherence was adopted. Means, frequencies, and percentages were used to analyze level of adherence, sociodemographic and clinical factors. Logistic regression analysis was used to determine association of factors to medication non-adherence.
**Results**: There was a total of 69 participants. Overall, there was partial adherence to T2DM medications. There was a high prevalence of partial adherence (39.1%) in the cost-related non-adherence (CRNA) domain. Factors that showed non-significant increased odds of non-adherence included older age (AOR 1.363, 95% CI 0.345-5.386), female sex (AOR 1.544, 95% CI 0.386-6.176), low income (AOR 1.05, 95% CI 0.352-3.135), increased frequency of daily medication intake (AOR 1.436, 95% CI 0.44-4.664), and less than 10 years duration of T2DM (AOR 1.99, 95% CI 0.46-8.637).
**Conclusion**: Adherence to diabetes medication may be affected by medication costs and financial status as reflected in the overall partial adherence, the high prevalence of partial adherence in CRNA domain, and the increased odds of non-adherence with low income. More studies should be done to investigate other possible contributing factors for non-adherence to diabetes medication such as diabetes knowledge, patient's self-efficacy, and healthcare provider communication.

**Key words**: diabetes, medication adherence

## BACKGROUND

Diabetes mellitus type 2 (T2DM) is a growing health issue in the world today. In the 2019 World Health Organization report, diabetes now belongs to the top ten causes of death worldwide.[1] In the Philippines, diabetes is the fourth leading cause of death.[2] Medication adherence is one important yet often neglected aspect in the management of T2DM. About half of the patients suffering from chronic illnesses in developed countries are non-adherent to their prescribed medication.[3] In developing countries, the rates are even higher.[4] These alarming facts continue to challenge physicians in the control of T2DM and in preventing complications.

Medication adherence is one of the major factors in determining success of therapy, particularly for individuals who are living with chronic diseases.[4] Several studies have shown that non-adherence to diabetes medications is associated with inadequate control of diabetes,

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increased odds of hospitalization, higher health care costs, and higher rates of mortality.[5,6,7]

It is said that more health benefits worldwide would result from improving adherence to existing treatments rather than developing any new medical treatments.[4] Thus, determining adherence to diabetes medication and exploring the contributing factors are critical for individual health outcomes, effective disease management, and improved overall well-being of patients with T2DM.

This study aimed to determine the level of medication adherence among patients with T2DM at Cebu South Medical Center (CSMC) family medicine outpatient clinic from August 2023 to October 2023. Specifically, it explored the socio-demographic (age, sex, educational attainment, monthly household income) and clinical factors (number of diabetic medication, daily intake of medication, type of medication, duration of diabetes, presence of co-morbidities) that may contribute to T2DM medication non-adherence. The prevalence of non-adherence in each factor and the association of these factors to medication non-adherence were also determined.

## Methods

### Study Design

A descriptive-analytical cross-sectional research design was used for this study. All adult patients with T2DM who consulted at the Family Medicine outpatient clinic during a specified timeframe were invited to participate. A complete enumeration of patients who met the inclusion criteria was done which yielded a total of 69 participants. The General Medication Adherence Scale (GMAS) by Naqvi et al (2018) was adopted and was used as part of the self-administered questionnaire to analyze the respondents' sociodemographic and clinical characteristics and determine association of factors to non-adherence to T2DM medications.[8]

### Study Setting

The study was conducted at CSMC, a 250-bed level three healthcare facility, located at San Isidro, Talisay City, Cebu during the period of August 1, 2023 to October 31, 2023.

### Subjects

Inclusion criteria used were as follows: 1) all patients 18 years and above diagnosed with T2DM who sought consult in CSMC Family Medicine outpatient clinic in August 1 to October 31, 2023 with results of any of the following: random blood sugar, fasting blood sugar, or HbA1c, 2) participants who were diagnosed for at least 3 months with or without comorbidities, 3) participants who were taking diabetes medications as prescribed by their physicians, 4) participants who agreed to participate in the study and signed the informed consent forms. Exclusion criteria used were as follows: 1) those diagnosed with Type 1 diabetes mellitus, 2) patients with acute illness and/or who were suffering from complications of diabetes, 3) patients who could not communicate well with the researcher. A complete enumeration of

patients who met the inclusion criteria was done which yielded a total of 69 participants.

### Research Tool

This study utilized a three-part structured questionnaire. Part 1 contained the following demographic information: age, sex, educational attainment, and monthly family income. Part 2 contained the clinical characteristics of the participants. Medication adherence was assessed in Part 3 using a GMAS-based 11-item Likert-type questionnaire. The GMAS tool contained 11 questions in three domains namely 1) patient behavior-related non-adherence (PBNA) (i.e., unintentional and intentional non-adherence, 2) additional disease and pill burden related non-adherence (ADPB), and 3) cost-related non-adherence (CRNA). Each item was graded using Likert Scale: Always= 0, Mostly= 1, Sometimes= 2, Never=3. PBNA domain contained five items with 15 as the highest score; ADPB domain had four items with 12 as the highest score; CRNA domain contained two items with a score of six as the highest. Medication adherence was categorized into 5 levels namely high, good, partial, low, and poor adherence. Based on the overall score, a respondent was categorized under high adherence if the score is 30-33, good adherence if the score is between 27-29, partial adherence if the score is between 17-26, low adherence if the score is 11-16, and poor adherence if the score is 0-10. Dichotomous outcomes with an overall score below 27 was categorized as non-adherent, while an overall score of 27-33 was categorized as adherent. Permission to use, translate, and use locally was granted after sending an email to the author and agreeing with terms and conditions for the use of GMAS. The GMAS-adopted structured questionnaire was translated to Cebuano language and then back translated to English language by two authorized third-party Cebuano translator from the Cebuano Studies Center based at the University of San Carlos—Main Campus. The questionnaire underwent content validity with an overall agreement of 89% and internal consistency reliability was measured with a Cronbach's alpha value of 0.853.

### Data Analysis

This study used descriptive statistics to express the level of adherence, socio-demographic and clinical characteristics in frequency counts and percentages. The results were then presented in a frequency and percentage distribution table. Continuous data such as age and adherence score were reported using means and standard deviation. Binary logistic regression models were applied to determine the association between the identified factors and medication non-adherence. The gathered data in this study were processed using SPSS software version 25 with statistical significance at p value of <0.05.

### Ethical Considerations

This study was technically and ethically approved by the CSMC Technical Research Board (TRB) and Research Ethics Committee (REC). The participants were assured that data will be gathered in accordance to the Data Privacy Act of 2012. Once the participant fully understood

and agreed to participate in the research, the researcher obtained an informed consent. The patients were then asked to answer the self-administered questionnaire voluntarily. Anonymity and confidentiality were strictly implemented all throughout the course of the study.

## Results

A total of 92 patients were approached and out of them, 12 subjects did not give consent, 9 were excluded based on exclusion criteria, and 2 had missing data during the data analysis. Thus, the total number of respondents analyzed was 69 with a response rate of 75%. Participants had mean age of 58.52 (SD 11.72) years. The average overall adherence score among all participants was 25.6 (Median 29.0, SD 7.47) indicating partial adherence.

Table 1 shows the frequency counts and percentages of the socio-demographic and clinical profile of the study population. Most of the participants were aged more than 60 years (47.8%). There were more females (69.6%) than males (30.4%). Most respondents attained high school (40.6%).  Majority of the participants are coming from low-income families (72.5%) while 21.7% are from middle income, and 5.8% are from high income class. Majority of respondents had one diabetic medication (60.9%) and most medication intake were once a day (44.9%) with 84.1% who took oral only medication. There were more respondents (44.9%) who were diagnosed with diabetes more than 10 years ago while 26.9% were diagnosed less than 10 years ago. The remaining 29% of respondents were diagnosed within the year. Majority of respondents had only one co-morbidity (60.9%). Hypertension was the most common co-morbid condition identified (63.7%).

Table 1. Distribution of study participants in terms of sociodemographic characteristics (N=69).

| Sociodemographic Variable | | Frequency | Percent (%) |
|---|---|---|---|
| **Age** | 18-45 | 10 | 14.5 |
| | 46-60 | 26 | 37.7 |
| | >60 | 33 | 47.8 |
| **Gender** | Male | 21 | 30.4 |
| | Female | 48 | 69.6 |
| **Highest Educational Attainment** | Post Graduate | 3 | 4.3 |
| | College Graduate | 15 | 21.7 |
| | College Undergraduate | 12 | 17.4 |
| | High School | 28 | 40.6 |
| | Elementary | 11 | 15.9 |
| **Monthly Family Income** | < PHP 19,040 | 50 | 72.5 |
| | PHP 19,040 - PHP 114,240 | 15 | 21.7 |
| | > PHP 114,240 | 4 | 5.8 |
| **Clinical Characteristics** | | | |
| **# of Diabetic Medication** | 1 diabetic medication | 42 | 60.9 |
| | 2 diabetic medications | 22 | 31.9 |
| | >2 diabetic medications | 5 | 7.2 |
| **Daily Intake of Diabetic Medication** | once a day | 31 | 44.9 |
| | twice a day | 28 | 40.5 |
| | thrice a day | 10 | 14.5 |
| **Type of Diabetic Medication** | oral only | 58 | 84.1 |
| | injectable only | 3 | 4.3 |
| | combination | 8 | 11.6 |
| **Duration of Diabetes** | >10 years | 31 | 44.9 |
| | <10 years | 18 | 26.1 |
| | 1 year | 20 | 29 |
| **Co-morbidity** | None | 14 | 20.3 |
| | 1 co-morbidity | 42 | 60.9 |
| | 2 or more co-morbidity | 13 | 18.8 |

Table 2 shows the frequency counts and percentages of the adherence results. Majority of respondents had high adherence in the two domains, PBNA (52.2%) and ADPB (68.1%) while there was a high prevalence of partial adherence (39.1%) in the CRNA domain. Overall, 34.8% of respondents had high adherence, 27.5% good adherence, 24.6% partial adherence, and 7.2% poor adherence. In a dichotomous outcome, 62.3% of participants were adherent while 37.7% were non-adherent to their diabetes medication.

Table 3 shows the cross tabulation of sociodemographic and clinical characteristics to the dichotomous outcomes of adherence (adherent, non-adherent). Results showed that non-adherence is more prevalent among those who had elementary education (72.3%) and those who were diagnosed less than 10 years ago (51.6%).

All the factors analyzed did not show a significant association with non-adherence to diabetes medication (Table 4). However, we can observe that older age, female sex, low income, increased frequency of daily intake, and less than 10 years duration of T2DM showed non-significant increased odds of non-adherence (AOR > 1).

## Discussion

Based on the GMAS scores, there was partial adherence among patients with T2DM at Cebu South Medical Center Family Medicine outpatient clinic. Overall, there was a prevalence of 34.8% high adherence, 27.5% good adherence, 24.6% partial adherence, 5.8% low adherence, and 7.2% poor adherence. In a dichotomous outcome, it was found that 62.3% of participants were adherent and 37.7% of participants were non-adherent. Older age, female sex, low income, increased frequency of daily intake, and less than 10 years duration of T2DM showed non-significant increased odds of non-adherence.

The results of this study were comparable to the study in Saudi Arabia by Alqarni et al (2019) using the GMAS, which showed that there

**Table 2**. Distribution of adherence results per domain and overall (N=69).

| Adherence Variable | Scoring by Domain | Frequency (N=69 per domain) | Percent (%) |
|---|---|---|---|
| **Patient Behavior related Non-Adherence (PBNA)** | Poor Adherence (0 - 4) | 8 | 11.6 |
| | Low Adherence (5 - 7) | 4 | 5.8 |
| | Partial Adherence (8 - 10) | 10 | 14.5 |
| | Good Adherence (11 - 12) | 11 | 15.9 |
| | High Adherence (13 - 15) | 36 | 52.2 |
| **Additional Disease and Pill Burden Related Non-Adherence (ADPB)** | Poor Adherence (0 - 3) | 4 | 5.8 |
| | Low Adherence (4 - 5) | 1 | 1.4 |
| | Partial Adherence (6 - 8) | 5 | 7.2 |
| | Good Adherence (9 - 10) | 12 | 17.4 |
| | High Adherence (11 - 12) | 47 | 68.1 |
| **Cost Related Non-Adherence (CRNA)** | Poor Adherence (0 - 1) | 5 | 7.2 |
| | Low Adherence (2) | 3 | 4.3 |
| | Partial Adherence (3 - 4) | 27 | 39.1 |
| | Good Adherence (5) | 12 | 17.4 |
| | High Adherence (6) | 22 | 31.9 |
| **Overall Adherence** | Poor adherence (0-10) | 5 | 7.2 |
| | Low adherence (11-16) | 4 | 5.8 |
| | Partial adherence (17-26) | 17 | 24.6 |
| | Good adherence (27-29) | 19 | 27.5 |
| | High adherence (30-33) | 24 | 34.8 |
| **Overall Adherence (Dichotomous)** | Non adherent (<27) | 26 | 37.7 |
| | Adherent (27-33) | 43 | 62.3 |

**Table 3**. Cross tabulation of frequency and percentage distribution of adherence to sociodemographic and clinical characteristics (N=69)

| Variable | | Adherent (Frequency,(%)) | Non-adherent (Frequency,(%)) | Total (Frequen (%) |
|---|---|---|---|---|
| Age | 18-45 | 6 (60) | 4 (40) | 10 (14.5) |
| | 46-60 | 18 (69) | 8 (31) | 26 (37.6) |
| | >60 | 19 (57.6) | 14 (42.4) | 33 (47.8) |
| Sex | Male | 14 (66.7) | 7 (33.3) | 21 (30.4) |
| | Female | 29 (60.4) | 19 (39.6) | 48 (61.6) |
| Educational Attainment | Post Graduate | 2 (66.7) | 1 (33.3) | 3 (4.3) |
| | College Graduate | 12 (80) | 3 (20) | 15 (21.7) |
| | College Undergraduate | 9 (75) | 3 (25) | 12 (17.4) |
| | High School | 17 (60.7) | 11 (39.3) | 28 (40.6) |
| | Elementary | 3 (27.2) | 8 (72.3) | 11 (15.9) |
| Monthly Family Income | < PHP 19,040 | 31 (62) | 19 (38) | 50 (72.5) |
| | PHP 19,040 - PHP 114,240 | 9 (60) | 6 (40) | 15 (21.7) |
| | > PHP 114,240 | 3 (75) | 1 (25) | 4 (5.8) |
| Number of diabetic medications | 1 | 25 (59.5) | 17 (40.5) | 42 (60.9) |
| | 2 | 13 (59) | 9 (41) | 22 (31.9) |
| | >2 | 5 (100) | 0 (0) | 5 (7.2) |
| Daily intake | Once a day | 20 (64.5) | 11 (35.5) | 31 (44.9) |
| | Twice a day | 17 (60.7) | 11 (39.3) | 28 (40.5) |
| | Thrice a day | 7 (70) | 3 (30) | 10 (14.5) |
| Type of diabetic medication | Oral only | 36 (62) | 22 (38) | 58 (84.1) |
| | Injectable only | 2 (66.7) | 1 (33.3) | 3 (4.3) |
| | Combination | 5 (62.5) | 3 (37.5) | 8 (11.6) |
| Duration of Diabetes | <10 years | 15 (48.4) | 16 (51.6) | 31 (44.9) |
| | >10 years | 14 (77.8) | 4 (22.2) | 18 (26.1) |
| | 1 year | 14 (70) | 6 (30) | 20 (29) |
| Number of co-morbidities | None | 8 (57.1) | 6 (42.9) | 14 (20.3) |
| | 1 | 27 (64.3) | 15 (35.7) | 42 (60.9) |
| | >/= 2 | 8 (61.5) | 5 (38.5) | 13 (18.8) |

**Table 4.** Factors associated with non-adherence to medications among diabetic patients at CSMC from August to October 2023.

| Variable | | AOR (95% CI) | p value |
|---|---|---|---|
| Age | <60 (1) | 1.363 (0.345-5.386) | 0.659 |
| | >60 | | |
| Sex | Male (1) | 1.544 (0.386-6.176) | 0.539 |
| | Female | | |
| Educational Attainment | High School and below (1) | 0.235 (0.05-1.088) | 0.064 |
| | Above High School | | |
| Monthly Family Income | Low Income Middle to High income (1) | 1.05 (0.352-3.135) | 0.929 |
| Number of diabetic medications | 1 (1) 2 or more | 0.605 (0.17-2.103) | 0.429 |
| Daily intake | Once a day (1) | 1.436 (0.44-4.664) | 0.548 |
| | Twice a day or more | | |
| Type of diabetic medication | Oral only (1) | 0.876 (0.17-4.498) | 0.874 |
| | Injectable only | | |
| Duration of Diabetes | >10 years (1) | 1.99 (0.46-8.637) | 0.353 |
| | <10 years | | |
| Number of co-morbidities | None (1) | 0.516 (0.15-1.824) | 0.304 |
| | 1 | | |

AOR= Adjusted Odds Ratio; (1)= Reference group

was 35.8% prevalence of high adherence and the mean score for the overall adherence also reflected partial adherence (mean= 26.34 ± 5.6). Their study showed a slightly higher prevalence of non-adherence at 40.6% which attributed to the discontinuation of anti-diabetic medication during the months of Ramadan.[9] In contrast to this, a local study conducted in Bulacan and Manila, Philippines which included 64 patients showed only 4.69% non-adherent participants using the 11-item Morisky questionnaire. They attributed the high adherence to the active participation of patients to the quality healthcare services being provided to them.[10] Other studies done in other countries also showed a slightly higher prevalence of non-adherence as compared to the present study.[11,12,13] A study conducted in Ethiopia revealed a 41.5% (n=176) prevalence of non-adherence using Morisky questionnaire.[11] In Malaysia, 53% (n=557) of participants were non-adherent using the Medication Compliance Questionnaire.[12] In Singapore, a 57.1% (n=382) prevalence of medication non-adherence was seen among participants using the Medication Adherence Report Scale.[13] Thus, the percentage of non-adherence to medications among T2DM patients varies in different parts of the world which could be attributed to the differences in sample size, socio-economic status, and the use of adherence questionnaires. Elderly patients in this study had non-significant increased odds of being non-adherent to their diabetes medication (AOR=1.363; 95% CI 0.345-5.386). This coincides with a study done by Shams and Barakat in Egypt (2010) where there was a non-significant lower rate of adherence among elderly patients attributable to memory problems.[14] Other studies have shown that younger patients with chronic illness have poor adherence to their prescribed medications as compared to older ones. The disparity was attributed to health programs and free drugs prioritized to the elderly and that younger patients were less aware of their disease and were thus more likely to be more nonadherent.[12,15] Females had 1.5 times more odds of being non-adherent (AOR=1.544, 95% CI 0.386-6.176, p value 0.659). Studies that measure association of gender and adherence have conflicting results. The study of Mitiku, et al (2022) in Ethiopia showed that male patients were 6.47 times (AOR = 6.47, 95% CI: 2.37–17.68, P ≤ 0.001) more likely to be non-adherent than females.[11] Other studies show poor adherence among females.[16,17,18] Some of these studies report that females have significantly higher rates of medication non-adherence due to costs. The difference in results in terms of gender and medication adherence may be due to a large difference in the sample size, culture and gender roles of the different population groups. In this study, 72% belonged to low-income group which may be reflective of the distribution of patients in a government hospital setting. Of this, 38% were non-adherent. Analysis showed that participants in low-income group had 1.05 times non-significant higher odds of non-adherence (AOR= 1.05; 95% CI 0.352-3.135, p value 0.929). This finding coincides with a study done by Kirkman et al (2015) which showed that adherence was independently associated with higher income.[19] Thus, medication cost and financial status of patients could be one of the important contributing factors that affect medication adherence in patients with T2DM. Participants with less than ten years duration have non-significant increased odds of non-adherence (AOR=1.99; 95% CI 0.46-8.637). There is limited data with regards to the relationship between duration of diabetes and type of medication to adherence. Aloudah et al (2018) showed that there is

no significant correlation between diabetes duration and adherence.[20] However, Mitiku et al (2022) found that longer (>10 years) duration of treatment and presence of comorbidities was significantly associated with increased rate of non-adherence to anti-diabetic medications.[11] The present study yielded inconsistent results as most patients with one or more comorbidities were adherent to their medication with 0.5 times non-significant lower odds of non-adherence (AOR= 0.516, 95% CI 0.15-1.824, p value 0.3). Patients with additional medications, longer illness duration, and co-morbidities may have more increased awareness of the possible consequences of non-adherence which could explain their adherence to T2DM medications.

*Study Limitation*

The results of this study are not reflective of the entire T2DM population in Cebu or the Philippines since this study was conducted in Cebu South Medical Center Family Medicine outpatient clinic in Talisay City, Cebu only. Patients diagnosed with T2DM with or without co morbidities who sought consult at the outpatient clinic under the service of Family and Community Medicine were included but the results may differ if participants were taken from other institutions such as in private clinics or in local health units. Measurement of the level of adherence to diabetes medication was based on the score generated from participants' response to the GMAS questionnaire. The level of adherence may differ with the use of other medication adherence scales. Lastly, this study is limited by a short time period of data collection thus the population size was also limited which means that data gathered are not generalizable and not representative of the general population of T2DM patients.

## CONCLUSION AND RECOMMENDATION

This study determined that study participants with T2DM at Cebu South Medical Center Family Medicine outpatient clinic from August to October 2023 had partial adherence to their medications and that there was a prevalence of 37.7% non-adherence. The study also revealed a high prevalence of partial adherence in CRNA domain, and a non-significant increased odds of non-adherence in the low-income group. Thus, medication costs and financial status of the study subjects could be important factors that influence medication adherence. Although government programs that address access to affordable and effective T2DM medications are already available, the presence of 37.7% non-adherence in this study population could mean that there is a need to further strengthen implementation of such health programs. More programs could still be advocated to benefit T2DM patients with low-income and low health literacy. Further research in the local setting may be conducted using GMAS tool using a larger population with a longer duration and using an interventional approach to further enhance evidence on medication adherence. The author also recommends exploring other possible contributing factors to non-adherence such as diabetes knowledge and health beliefs, cultural values, healthcare system factors, self-efficacy and motivation.

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