Master of Science in Public Health

Diabetic Health Literacy And Medication Adherence

Among Geriatrics With Type 2 Diabetes Mellitus

Visiting A Tertiary Care Hospital of Rawalpindi City.

By

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Diabetic Health Literacy And Medication Adherence Among Geriatrics With Type 2 Diabetes Mellitus Visiting A Tertiary Care Hospital of Rawalpindi City.

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DECLARATION

In submitting this dissertation, I certify that I have read and understood the rules and regulations of ASOPH and QAU regarding assessment procedures and offences and formally declare that all work contained within this document is my own apart from properly referenced quotations.

I understand that plagiarism is the use or presentation of any work by others, whether published or not, and can include the work of other candidates. I also understand that any quotation from the published or unpublished works of other persons, including other candidates, must be clearly identified as such by being placed inside quotation marks and a full reference to their source must be provided in proper form.

This dissertation is the result of an independent investigation. Where my work is indebted to others, I have made acknowledgments.

I declare that this work has not been accepted in substance for any other degree, nor is it currently being submitted in candidature for any other degree.

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ABSTRACT

Background: Diabetic health literacy and diabetic medication adherence are essential to enable self-management and shared decision making in geriatric patients with type 2 diabetes mellitus. Less known about diabetic health literacy and poor diabetic mediation adherence gives poor outcome and have a great impact on glycemic control and lead to diabetic complications.

Objective: This study was conducted to determine the diabetic health literacy, diabetic medication adherence and find out the association between diabetic health literacy and medication among geriatrics visiting a tertiary care hospital of Rawalpindi city.

Methodology: A cross-sectional study was employed at the outpatient diabetic clinic of the tertiary care hospital of Rawalpindi city from September 2022-febuary 2023.The comprehensive 14-items diabetic health literacy question with a 5-point Likert scale used to measure diabetic health literacy. Morisky Green Levine Scale 7 item medication adherence assessment tool was used to assess the diabetic medication adherence of patients. Chi-square test was used to assess the association between socio-demographics, diabetic health literacy and diabetic medication adherence.

Results: Out of 264 respondents 57.2% were male and 42.8% were female. Majority of respondents belonged to urban area and had family history of diabetes mellitus .The study revealed that male respondents had more diabetic health literacy then female followed by diabetic medication adherence seemed better in male respondents. The association between diabetic health literacy and medication adherence showed statistically significant results, respondents with high diabetic health literacy had good diabetic medication adherence followed by respondents with moderate diabetic health literacy had moderate diabetic medication adherence and respondents with low diabetic health literacy had low diabetic medication adherence.

Conclusion: Diabetic health literacy and medication adherence are highly associated. All variables gender, residency, educational status and family history of diabetes mellitus are associated with diabetic health literacy and diabetic medication adherence.

Keywords: Diabetic health literacy, Medication adherence, Geriatrics, Type 2 diabetes mellitus.

CHAPTER I: Introduction

1.0. Introduction.

There is a widespread issue of medication non-adherence, particularly among older people. Pakistan's older adult population has also grown rapidly. As per Pakistan Bureau of Statistics, the percentage of people over 60 years of age has increased from 6.6% in 1998 to 9.2% in 2017. Increased life expectancy and improved healthcare have contributed to this trend, and it has become an important concern for healthcare professionals and academics in Pakistan (Ullah, S., & Malik, M. N.2019). It is estimated, that the number of older adults in Pakistan will continue to increase in the upcoming years. As the population ages, there will be a higher demand for prescriptions for health conditions and chronic illnesses. Healthcare system in Pakistan will need to adapt to meet the needs of this growing older population (Naz, L., Ghimire, U., & Zainab, A. 2021).

When providing care for elderly patients, healthcare providers in Pakistan may face many challenges, such as drug addiction, poor adherence to medication, and the risk of overdose. These issues, as highlighted by The Gerontological Society of America in 2013, are extremely important to consider due to the potential risks and complications that can arise in the elderly population. Therefore, it is important for healthcare professionals to be aware of these issues and take appropriate measures to provide safe and effective care to their senior patients. This can include close monitoring, education on medication use, and addressing any underlying mental health or social issues that may contribute to drug addiction or poor adherence.

Haskard-Zolnierek and DiMatteo (2009) provided a definition of patient adherence to medical advice as "the extent to which individuals follow the instructions of their health professionals" . In contemporary literature, the term "compliance" has been replaced with "adherence" (Brincat , 2012) due to the negative connotation of the former term, which suggested a power dynamic in which the physician held complete authority over the patient. The terms "unfaithful" and "untrustworthy" were used in medical literature in the early twentieth century, but these terms failed to recognize the importance of a collaborative relationship between the physician and the patient (Steiner & Earnest, 2000). While the terms "adherence" and "compliance" are often used reciprocally, "adherence" implies a willingness on the part of the patient to follow the recommendations of the healthcare provider, whereas "compliance" suggests a more passive role for the patient (Brown & Bussell, 2011,).

It is worth notable that the term "compliance" was originally coined by a group of healthcare professionals in the United Kingdom, and it also refers to the medical consultation as a conversation between the physician and the patient (Bissell, May, & Noyce, 2004). However, as mentioned earlier, the term has fallen out of favor in current literature due to its negative associations, and "adherence" is now the preferred term to describe the magnitude to which

patients follow the instructions of their healthcare providers. Nevertheless of the terminology used, it is important for healthcare providers to encourage a synergistic relationship with their patients to promote adherence and improve health outcomes.

Non-adherence occurs when individuals do not follow the suggested medication regimen, such as stopping the medication or failing to initiate treatment as prescribed. This can have serious results, as inadequate adherence to medical therapy can compromise patient outcomes and increase the risk of mortality (Brown & Bussell, 2011,). According to Brincat (2012), non-adherence may be either deliberately or unintentional, depending on the underlying barriers. Unintentional non-adherence has been associated with factors such as financial restrictions, trouble in remembering to take medications, and challenges understanding instructions (Brincat, 2012). Healthcare providers must acknowledge these factors and work with their patients to address any hurdles that may hamper adherence to medical therapy, as this can have a remarkable impact on patient outcomes and overall health.

Improving medication adherence among older patients is necessary for improving healthcare outcomes, such as reducing hospitalization rates, reducing disease complications, and lowering long-term care expenses for patients (Brown et al., 2016). The World Health Organization has described low adherence to chronic disease treatment as a significant problem of global proportions (WHO, 2003). Adherence rates to long-term therapy for chronic diseases are reported to be around 50% in rich countries, and even lower in poorer countries (WHO, 2003). This highlights the need for healthcare providers to categorize efforts to improve medication adherence, particularly in older patients, to promote better health outcomes and lessen the negative impact of chronic diseases.

Type 2 diabetes is one of the most prevalent chronic conditions among older individuals, with an estimated 13% of people aged 65 and older being affected (Misiaszek, 2008). Older adults with diabetes often have inadequate insulin production or utilization. Oral medications are usually prescribed, some individuals may in the end require insulin therapy. Diabetes increases the risk of developing heart disease and has been linked with complications such as nephropathy, retinopathy, and non-traumatic amputations.

 Therefore, it is compulsory for older adults with diabetes to receive appropriate medical care, adhere to their medication regimens, and make lifestyle modifications to help manage their condition and reduce the risk of long-term complications. Depression is a common co-existing condition among individuals with diabetes (Canadian Diabetes Association, 2015). Despite the fact that managing diabetes requires significant lifestyle modification and medication adherence, older adults may opt for to take lower doses than prescribed (Cramer, 2004). Examining medication adherence among elderly individuals with diabetes can help healthcare professionals understand diabetes management and its clinical outcomes. Poor adherence to medication regimens can have an effect on future diabetes treatments, highlighting the importance of addressing this issue in diabetes care for older adults (Aikens & Piette, 2013).

Medication adherence for diabetes treatment can be influenced by various factors, and patients who are satisfied with their patient-provider relationship are more likely to adhere to their prescribed medication regimens (Heisler, Bouknight, Hayward, Smith, & Kerr, 2002; Rubin, 2005). While most research has focused on the physician-patient relationship, a recent study has highlighted the importance of the pharmacist-patient relationship in medication adherence, particularly for diabetes management. The study found that pharmacists are perceived as more approachable healthcare professionals than physicians for older patients with diabetes, which fosters long-term partnerships, trust, and increased communication. Better drug adherence is directly associated with the ease of access to pharmacists (Rickles et al., 2015; Worley, 2006). Considering the various factors that affect diabetes treatment adherence and patient-pharmacist communication, understanding the connection between them could be beneficial in educating healthcare providers and improving the quality of life of older adults.

1.1. Rationale.

In Pakistan where there is a increased level of illiteracy rate in geriatric population despite the formal education coverage is increasing in Pakistan the population literacy rate is still low with a total elderly literacy rate of 25.3% in 2014. There is less known about diabetic health education in Pakistan which might affect patient medication adherence, self-care and predicting factors of diabetic control. Therefore, this study aimed to assess the Diabetic health literacy and medication adherence among geriatrics with type 2 diabetes mellitus visiting tertiary care hospitals in Rawalpindi city.

Previously study has been done on influence of health literacy and medication adherence among elderly females with type 2 diabetes mellitus, assessing only general health knowledge and medication adherence

This study targets specific age group including both male and female population assessing their health knowledge particularly about diabetes mellitus and their medication compliance.

1.2. Objectives.

1. To determine the level of diabetic health literacy among geriatrics visiting a tertiary care hospital Rawalpindi city.

2. To find out the medication adherence of diabetic patients visiting a tertiary care hospital Rawalpindi city.

3. To find out the association between diabetic health literacy and medication adherence

4. To find out the association between socio-demographics factors with diabetic health literacy and medication adherence.

CHAPTER II: Literature Review

2.0. Literature Review.

This study is designed to emphasize on older diabetic population with respect to diabetic health literacy and diabetic medication adherence. As in developing countries like Pakistan illiteracy rate is high in elderly population. There is less known about diabetic health education in Pakistan which might affect geriatrics medication adherence, self-care and predicting factors of diabetic control.

The World Health Organization (2003) defines medication adherence as the degree to which a patient follows medical instructions, which may include taking prescribed medications, following a specific diet, engaging in physical activity, and avoiding negative habits such as smoking or drinking. The term "adherence" is preferred over "compliance" because it highlights the patient's active role in the treatment process and implies a collective relationship between the patient and healthcare provider (Brown & Bussell, 2011; Delamater, 2006). When a patient consistently follows their treatment plan over an extended period of time without significant breaks, it is referred to as "persistence" (Cramer et al., 2008).

Adhering to medical treatment is crucial for managing chronic conditions in older patients, as it can minimize hospitalization rates and mortality (Starr & Sacks, 2010). Lack of support for older adults with long-term prescribed drug therapies can often lead to medication non adherence (Murray et al., 2004). From the healthcare provider's point of view, signs of medication non adherence include a patient not filling a new prescription, not refilling a long-term medication as often as expected, stopping refilling long-term medications, or not finishing an entire course of acute medication (e.g. antibiotic) (Krueger, Berger, & Felkey, 2005). There are various types of medication non adherence, with Jimmy and Jose (2011) suggesting three types: primary non adherence (failing to fill a prescription), nonpersistence (stopping medication after treatment has started), and nonconforming behavior (such as taking a higher or lower dosage than prescribed or skipping doses) (Jimmy & Jose, 2011). Non persistence can be either unintentional (e.g. due to health issues or cognitive decline) or intentional (e.g. purposely skipping doses) (Brincat, 2012).

There are various factors that can contribute to medication nonadherence in older patients, as well as health literacy (Lee, Yu, You, & Son, 2015), bad understanding of the medication (Barat, Andreasen, & Damsgaard, 2001), cognitive impairment (Campbell et al., 2016), and difficulties opening medication containers (Atkin, Finnegan, Ogle, & Shenfield, 1994). Krueger et al. (2005), Murray et al. (2004), and Yap et al. (2015) have identified various factors that affect medication adherence in older adults. Yap et al. (2015) identified five main categories: medication-related factors (such as the type of medication, dosing regimen, and drug interactions), system-based factors (such as patient education, follow-up care, and availability of nursing support), patient factors (such as mental and physical health, medical history, and beliefs about medical treatment), physician factors (such as trust and satisfaction with medical visits, patient involvement, and communication with the healthcare provider), and other factors (such as lack of a caregiver).

Health professionals are concerned about evaluating medication adherence among seniors because of physical and cognitive changes, such as memory loss, may affect their ability to take prescribed medications (Kessels, 2003; Raehl, Bond, Woods, Patry, & Sleeper, 2002). According to Salthouse (2009), even though some cognitive abilities may begin to decline slightly before age 30, the decline in certain areas, such as memory, becomes more pronounced after age 60 (Salthouse, 2009).

There are several hurdles to health literacy and medication adherence among older adults with T2DM in Asian countries. One obstacle is the lack of patient understanding of T2DM and its management, which can be effected by cultural beliefs and practices (Ho et al., 2018). For example, some Asian cultures may put a greater stress on traditional medications, leading to lack of trust in western medicine or hesitation to take medications as advised (Ho et al., 2018). Additionally, language barriers, illiteracy, and low education levels may participate to poor health literacy in older adults (Lin et al., 2018).

A systematic review by (Ho et al., 2018) found that interventions which focus on both health literacy and medication adherence had the greatest impact on improving glycemic control and reducing complications in older adults with T2DM. These interventions included patient education programs, medication review and reconciliation, self-monitoring of blood glucose, and the use of technology such as mobile phone reminders and electronic medication management systems.

Other studies have also emphasize on the importance of addressing both health literacy and medication adherence in improving T2DM management in older adults. For example, a study in Taiwan found that a combination of health education and medication management interventions improved medication adherence and glycemic control in older adults with T2DM (Chang et al., 2016). Similarly, a review by Wang et al. (2015) found that interventions that focused on both health literacy and medication adherence were effective in improving glycemic control in older adults with T2DM in Asian countries.

In conclusion, improving health literacy and medication adherence is important for effective T2DM management in older adults in Asian countries. Interventions that address both factors, such as patient education programs and the use of technology for self-management, may have the greatest effect on improving glycemic control and reducing complications in this population. It is important for healthcare providers to consider cultural beliefs and practices, language barriers, and other individual factors that may effect health literacy and medication adherence in older adults with T2DM in Asian countries.

Older individuals with Type 2 Diabetes Mellitus (T2DM) in Pakistan often face challenges related to both diabetic health literacy and medication adherence. Health literacy, or the ability to obtain and understand information needed to make informed health decisions, is crucial for managing T2DM and can impact medication adherence (Lee et al., 2015). Poor health literacy has been linked to poor glycemic control and an increased risk of hospitalization in older adults with T2DM (Lin

et al., 2018; Wang et al., 2018). Medication adherence, or consistently following a prescribed treatment plan, is also important for managing T2DM in older adults. Nonadherence to medication regimens has been linked to worse glycemic control and a higher risk of complications such as cardiovascular events and hospitalization (Boussageon et al., 2011; Ho et al., 2018). A study in Pakistan found that medication adherence was associated with better glycemic control and a lower risk of hospitalization in older adults with T2DM (Ahmed et al., 2014). To address these issues, interventions such as patient education programs, support from healthcare providers, and the use of technology to facilitate self-management may be helpful in improving health literacy and medication adherence in older adults with T2DM in Pakistan (Ho et al., 2018).

2.1. Operational Definitions.

Geriatrics: 60 years and above.

Type of Diabetes: Type 2 Diabetes mellitus.

High diabetic health literacy: if diabetic health literacy assessment score is 75% and above.

Moderate diabetic health literacy: if diabetic health literacy assessment score is between 60-74%.

Low diabetic health literacy: if diabetic health literacy assessment score is less than 59%.

Good adherence: 6-7 point from morisky diabetic medication adherence scale consider as good adherence assessment score.

Moderate adherence: Less than 6 and more than 4 point from morisky diabetic medication adherence scale consider as moderate adherence assessment score.

Poor adherence: Equal or less than 3 point from morisky diabetic medication adherence scale consider as low adherence assessment score.

CHAPTER III: Methodology

3.1. Research Question.

What are the effects of diabetic health literacy and medication adherence on geriatric population visiting a tertiary care hospital of Rawalpindi city.

3.2. Study Design.

It was a cross sectional study.

.3.3. Study Setting.

Study setting for this research was the tertiary care hospital of Rawalpindi City.

3.4. Study Duration.

Study duration was from Sept 2022 to Feb 2023.

3.5. Sample Size.

264 (at 20 % prevalence, Hashmi *et al*; 2019).

3.6. Sampling Technique.

Convenience sampling were used to collect the data from geriatrics patients available in the outpatient department of diabetic clinics of tertiary care hospital of Rawalpindi city.

3.7. Sample Selection.

3.7.1 Inclusion Criteria.

- 60 years and above.

- Known diabetic for 5 years.

- Both gender male and female.

- Able to understand and answer the questions in Urdu language.

3.7.2 Exclusion Criteria.

- Patients with visual and communication impairment.

- Mental disorder with cognitive impairment.

- Those who will not agree to participate would exclude from study.

3.8. Data Collection Procedure.

Data was collected from respondents after taking informed consent by using the interview based questionnaire. The questionnaire was translated in local language for the better understanding and able to answer the questions in a better way.

- IRB approval was taken from the ethical committee of Al-Shifa school of Public Health after synopsis presentation.

3.9 Ethical Consideration.

- Informed consent form is attached in annexure that was signed from every participants before data collection.
- The information collected from the participants will only be used for the purpose of research.
- All the information and data is kept strictly confidential.
- There was no risk in research.
- Benefits: This study highlighted the diabetic health literacy and medication adherence in diabetic patients. Implication of this study helped us to better understand the diabetic medication adherence and diabetic health literacy level of geriatric population for control of diabetes.
- Permission letter was taken from the tertiary care Hospital authorities to access the data from diabetic patients.

CHAPTER IV: Results

4.1. Socio-demographic Characteristics of the Study Population

The comprehensive 14 items diabetic health literacy questions with a 5- point Likert scale was used to measure diabetic health literacy. The mean score was calculated and switched to the percentage (5 points as 100%) to determine the level of diabetic health literacy. Morisky medication adherence scale (MMAS-7) was used to assess the diabetic patient level of medication adherence. DHL Scale containing 5 points Likert scale from strongly disagree, disagree, neutral, agree, and strongly agree.

There were 264 patients with type 2 diabetes mellitus in this study. As shown in the table below total of 151 (57.2%) were males and 113 (42.8%) were females and the mean age of the participants was 64.31+ 3.655 years. Among 264 there were 223 (84.5%) married 5 (1.9%) were single and 36(13.6%) were divorced or widowed .There were 201 (76.1%) respondents living in urban area and 63 (23.9%) living in rural area. The educational status of the study participants showed that they 70 (26.5%) had elementary school education, 55 (20.8%) high school education, 25 (9.5%) higher institute education, among them 5 (1.9%) able to read and write and 110 (41.7%) were unable to read and write.

There were 143 (54.2%) who had monthly income les then ten thousands in Pakistani rupees (PKR).while 82 (31.1%) had ten thousand to twenty thousand and 35 (13.3%) had in between twenty thousand to fifty thousand and only four respondents had monthly income more than fifty thousand. There were 145 (54.9%) respondents had family history of diabetes mellitus and 119(45.1%) were with no family history of diabetes mellitus. There were 177 (67.0%) respondents with five to ten year duration of disease followed by 87(33.0%) with more than ten years of disease. The treatment regime of the study participant showed that there were 113 (42.8%) on oral hypoglycemic drugs. 58 (22.0%) were on insulin therapy and 93 (35.2%) on insulin along with oral hypoglycemic agents.

Occupational status of the study respondents showed there were 103 (39.0%) house wife's, 109 (41.3%) had their own business, and 34 (12.9%) retired from job. Social drug status of the respondents showed majority 193 (73.1%) were taking tea, 51 (19.3%) were taking tea and smoking cigarette .Comorbidities of respondent showed mostly had hypertension 142 (53.8%), arthritis 65 (24.6%), hypertension and renal disease 53 (20.1%) and so on. Majority of respondents had retinopathy 83 (31.4%), diabetic foot ulcer 32 (12.1%) and coronary artery disease in 43 (16.3%).

4.2. Socio-Demographic Variable of the Study Population.

Gender	n (%)
Male	151 (57.2%)
Female	113 (42.8%)
Marital Status	
Married	223 (84.5%)
Single	05 (1.9%)
Divorced/Widowed	36 (23.9%)
Residency	
Urban	201(76.1%)
Rural	63(23.9%)
Educational Status	
Elementary School	70 (26.5%)
High School	55 (20.8%)
Higher institute	24 (9.1%)
Able to read and write	5 (1.9%)
Unable to read and write	110 (41.7%)
Average monthly income	
<10000	142 (53.8%)
10000-20000	82 (31.1%)
20000-50000	35 (13.3%)
>50000	04 (1.55)
Treatment Regime	
Oral hypoglycemic agents	113 (42.8%)

Insulin	58 (22.0%)
Insulin+ oral hypoglycemic agent	93 (35.2%)
Family History	
Yes	145(54.9%)
No	119(45.1%)
Duration of Disease	
Less than 5 years	0
5-10 years	177 (76.0%)
Greater than 10 years	87 (33.0%)
Occupational Status	
Private job	18 (6.9%)
House Wife	103 (39.0%)
Retired	34 (12.9%0
Own business	109 (41.3%)
Social Drug Status	
None	4 (1.5%)
Coffee	4 (1.5%)
Tea	193 (73.1%)
Alcohol	1 (.4%)
Cigarette	8 (3.0%)
Tea+ cigarette	51 (19.3%)
Comorbidities	
Anemia	33 (12.5%)
Arthritis	65 (24.6%)
CKD	8 (3.0%)

CLD	16 (6.1%)
Dyslipidemia	47 (17.8%)
Heart Failure	7 (2.7%)
HIV	2 (.2%)
Hypertension	142 (53.8%)
HTN+ Renal Disease	53 (20.1%)
Peptic Ulcer Disease	18 (6.8%)
Stroke	16 (6.1%)
Complications	
Coronary artery disease	43 (16.3%)
Diabetic foot ulcer	32 (12.1%)
Nephropathy	27 (10.2%)
Neuropathy	24 (9.1%)
Peripheral artery disease	8 (3.0%)
Retinopathy	83 (31.4%)

As shown in Diabetic complication chart below. 8 (3.0%) of diabetic respondents had Peripheral artery disease, majority of diabetic patients had 83 (31.4%) Retinopathy, 24(9.1%) had had

Coronary artery disease. Neuropathy, 27 (10.2%) had Nephropathy, 32 (12.1%) had Diabetic foot ulcers and 43(16.3%) had coronary artery disease

4.3. Diabetes Complications.
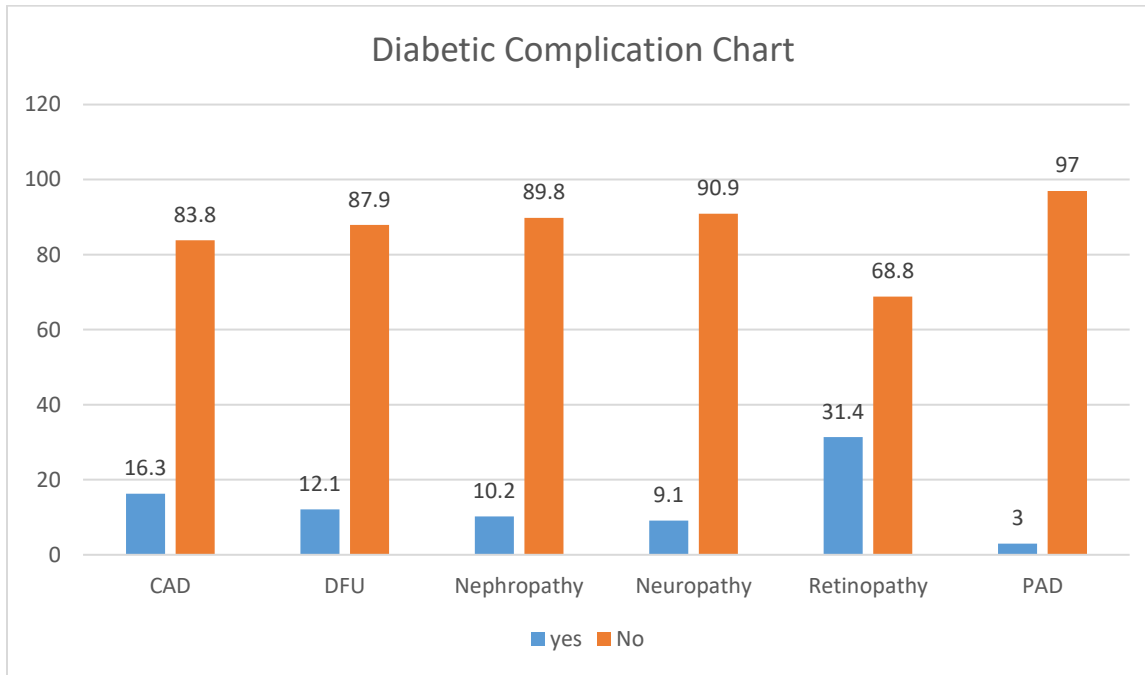
As shown below in treatment regime chart. Majority of respondents 113(42.8%) were on oral hypoglycemic agents followed by 58 (22.0%) were on Insulin and 93 (35.2%) were on combine Insulin and oral hypoglycemic agents.

4.4. Treatment Regime.
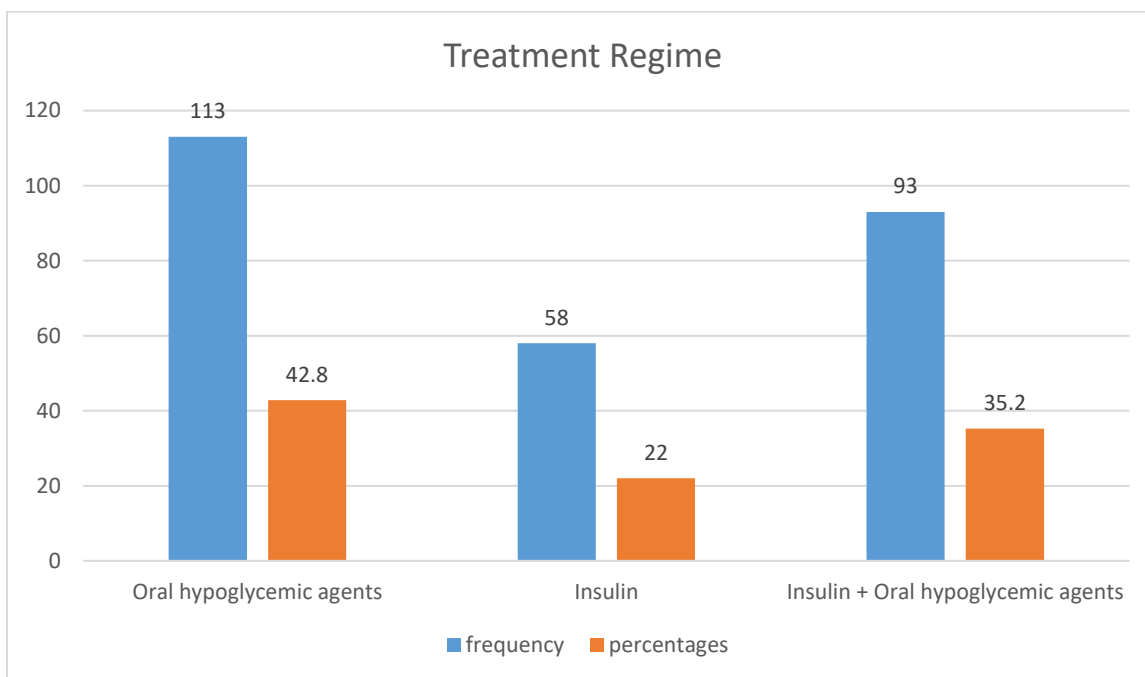
4.5. Diabetic Health Literacy.

There were 79 (29.9%) majority of respondents strongly disagree to read and understand educational material and booklets fallowed by 58 (22.0%) respondents were disagree, 25(9.5%) were neutral, 67 (25.4%) were Agree and 35(13.3%) respondents strongly agree .Majority of respondents81 (30.7%) were strongly disagree from understand the written information provided at the time of appointment and 52 (19.7%) were disagree fallowed by 70 (26.5%) answer agreed .Majority of the respondents were agreed 174 (65.9%) on the comprehend the information I sought

on diabetes ,followed by 54 (20.5%) were neutral and only 19 (7.2%) disagree .Majority of respondents151 (57.2%) were agree to understand the information on diabetes management from the health care provider fallowed by 51 (19.3%) were neutral and only 19 (7.2%) disagree. Majority of respondents 92 (34.8%) were neutral on judging diabetes related information is reliable fallowed by 78 (29.5%) were disagree and 75 (28.4%) were agree. Majority of respondents129 (48.9%) were able to calculate the next time to take diabetes medication, followed by 48 (18.2%) were strongly agree as well as 41 (15.5%) were neutral and 44 (16.7%) were disagree. Majority of respondents were strongly disagree to determine the carbohydrate content per serving from the nutrition label and 92 (34.8%) were disagree fallowed by 25 (9.5%) were neutral and very less amount of respondents 17 (6.4%) were able to determine carbohydrate content per serving. Majority of respondents101 (38.3%) were unable to interpret there glucose level with in the normal rang followed by 50 (18.9%) were neutral and 62 (23.5%) were able to interpret there glucose levels with in normal range. Majority of respondents 141(53.4%) were unable to understand information on diabetes presented as probabilities, ratios or on graphs followed by 17(6.4%) were neutral and 35 (13.3%) agree to understand information on diabetes. Majority of respondents 83 (31.4%) were unable to asked the question from health professional followed by 77 (29.2%) were neutral as well as 77 (29.2%) were able to asked question from health professional. Majority of respondents 181(68.6%) were able to explain their diabetic condition to health care provider followed by 43 (16.3%) were unable to explain their diabetic condition to health care provider and 14 (5.3%) were neutral respondents. Majority of respondents 152 (57.6%) were able to understand the reason why they should have diabetic diet, followed by 47 (17.8%) were strongly agree and 39 (14.8%) were neutral and only 26 (9.8%) respondents are unable to understand .Majority of respondents114 (43.2%) were able to knowing and practicing the appropriate storage condition of diabetic medications followed by 63 (23.9%) respondents were not able to understand and practicing the appropriate storage condition of diabetes medications and 61 (23.1%) were gave the neutral response. Majority of respondents118 (44.7%) were disagree to understand all diabetic related medication information followed by 82 (31.1%) were able to understand all diabetic related medication information and 54 (20.5%) were gave neutral response.

4.6. Diabetic Health Literacy Scale.

Diabetic Health Literacy Questions	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Read & understand educational material and booklets.	79 (29.9%)	58 (22.0%)	25 (9.5%)	67 (25.4%)	35 (13.3%)
2. Understand the written information provided at the appointment.	81 (30.7%)	52 (19.7%)	32 (12.1%)	70 (26.5%)	29 (11.0%)
3. Comprehend the information I sought on diabetes.	0	19 (7.2%)	54 (20.5%)	174 (65.9%)	17 (6.4%)
4. Understand the information on diabetes management from the health care provider.	6 (2.3%)	30 (11.4%)	51 (19.3%)	151 (57.2%)	26 (9.8%)
5. Judge if diabetes related information is reliable.	6 (2.3%)	78 (29.5%)	92 (34.8%)	75 (28.4%)	13 (4.9%)
6. Calculate the next time to take diabetes medication.	2 (.8%)	44 (16.7%)	41 (15.5%)	129 (48.9%)	48 (18.2%)
7. Determine the carbohydrate content per serving from the nutrition label.	130 (49.2%)	92 (34.8%)	25 (9.5%)	17 (6.4%)	0

8. Interpret if my blood glucose levels is within the normal range.	44 (16.7%)	101 (38.3%)	50 (18.9%)	62 (23.5%)	7 (2.7%)
9. Understand information on diabetes presented as probabilities, ratios or on graphs.	141 (53.4%)	70 (26.5%)	17 (6.4%)	35 (12.3%)	1 (0.4%)
10. Ask health professional a question.	3 (1.1%)	83 (31.4%)	75 (28.4%)	77 (29.2%)	26 (9.8%)
11. Explain my diabetes condition to health care provider.	1 (0.4%)	43 (16.3%)	14 (5.3%)	181 (68.6%)	25 (9.5%)
12. Convey the reason why I should have a diabetic diet.	0	26 (9.8%)	39 (14.8%)	152 (57.6%)	47 (17.8%)
13. Knowing and practicing the appropriate storage condition of diabetic medications.	2 (.8%)	63 (23.9%)	61 (23.1%)	114 (43.2%)	24 (9.1%)
14. Understand all diabetic related medication information.	7 (2.7%)	118 (44.7%)	54 (20.5%)	82 (31.1%)	3 (1.1%)

4.7. Diabetic Medication Adherence.

Majority of respondents 152 (57.6%) were forget to take their prescribed medicines followed by 112 (42.2%) not forget to take their prescribed medicine sometimes, Majority of diabetic patients 154 (58.3%) were not take their prescribed medications any days over the past two weeks followed by 110 (41.7%) respondents give answer no. Majority of respondents 179 (76.8%) were not stop taking their medicines because you feel worse when you took it, followed by85 (32.2%) were stop taking their diabetic medications because they feel worse when they took it. Majority of respondents 135 (51.1%) were forgot to bring their diabetic medication when travel outside or leave home followed by 129 (48.9%) were not forget to bring their diabetic medication when travel outside or leave home. Majority of diabetic patients 212 (80.3%) were took their prescribed diabetic medication yesterday followed by 52 (19.7%) not took their prescribed diabetic medication yesterday. Majority of respondents 153 (58.0%) were not sometimes stop to take their medications when they feel their health is under control, followed by 111 (42.0%) were sometimes stop taking their diabetic medication when they feel their health is under control, Majority of respondents 182 (68.9%) were feel hassled sticking to their prescribed treatment plan followed by 81 (30.7%) were not feel hassled sticking to their treatment plan.

4.8. Diabetic Medication Adherence Scale.

Serial no	Question	Yes %	No %
1	Do you sometimes forget to take your prescribed medicines?	152 (57.6%)	112 (42.2%)
2	Over the past two weeks, where there any days when you did not take your prescribed medicine?	154 (58.3%)	110 (41.7%)
3	Have you stop taking diabetic medications because you feel worse when you took it.	85 (32.2%)	179 (67.8%)
4	When you travel or leave home, do you some time forget to bring along your medicine?	135 (51.1%)	129 (48.9%)
5	Did you take prescribed medicine yesterday?	212 (80.3%)	52 (19.7%)
6	When you feel like your health is under control, do you sometimes stop taking your medicine?	111 (42.0%)	153 (58.0%)

7	Do you feel hassled about sticking to your prescribed treatment plan?	81 (30.7%)	182 (68.9%)

Graphical Representations of Diabetic Health Literacy below shows 62(23.5%) of respondents had good diabetic health literacy followed by 65 (24.6%) respondents had Moderate Diabetic health literacy and 137 (51.9%) had low Diabetic Health Literacy.

4.9. Diabetic Health Literacy.
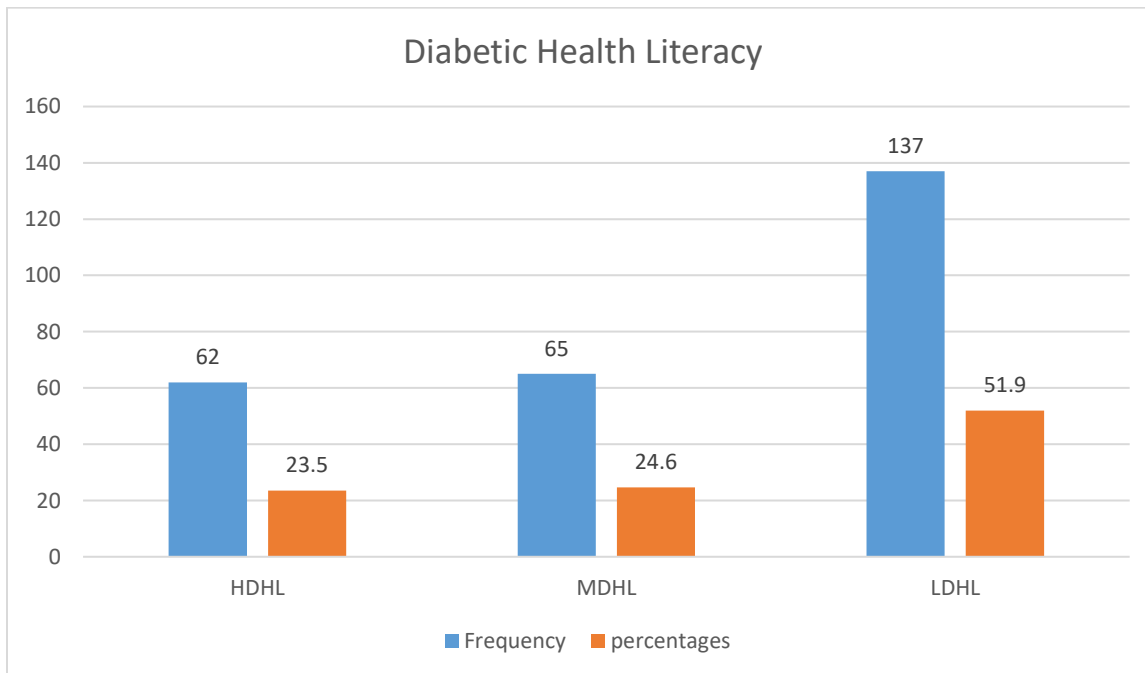
As shown in the diabetic medication adherence chart below 31 (11.7%) of respondents had good Diabetic Medication Adherence followed by 71(26.9%) of respondents had moderate Diabetic Medication Adherence and 162 (61.4%) of respondents had Low Diabetic Medication Adherence.

4.10. Diabetic Medication Adherence.

Diabetic Medication Adherence

(Bar chart showing Frequency and Percentages for three categories:)

- Good MA: Frequency 31, Percentages 11.7
- Moderate MA: Frequency 71, Percentages 26.9
- Low MA: Frequency 162, Percentages 61.4

Legend: ■ Frequency ■ Percentages
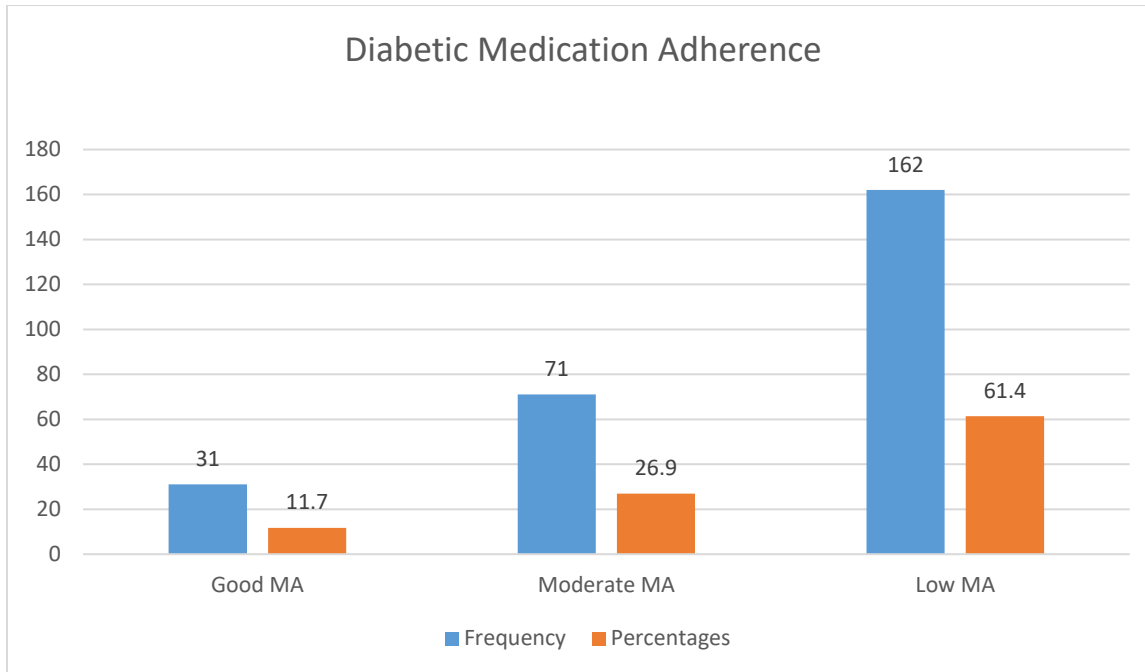
4.11. Association of Diabetic Health Literacy with Socio-Demographics variables.

In inferential statistics, chi-square test was used to assess the association between independent variable (gender, residency, educational status, average monthly income, treatment regime, duration of disease, occupational status, comorbidities, complications, social drug history) and dependent variables (diabetic health literacy, and diabetic medication adherence) . In chi-square test, Pearson chi-value were calculated and P value 0.05 was considered statistically significant.

As shown in table above, there were 49(79%) with high diabetic health literacy as compared to females 13(21%) fallowed by 61(44.5%) males with low diabetic health literacy as compared to females 76(55.5%) with x^2(21.977) and p-value (.000) which is statistically significant. There is association between diabetic health literacy and gender. There were 60(96.8%) urbans with high diabetic health literacy and 2 (3.2%) rural respondents with high diabetic health literacy. Fallowed by 87 (63.5%) urban respondents were low diabetic health literacy as compared to 50 (36.5%) rural respondents were low diabetic health literacy with x^2 (28.291) and p-value .001 which is statistically significant. There is association between diabetic health literacy and residency. Majority of respondents with high school education 36 (58.1%) were with high diabetic health literacy fallowed by 23 (37.1%) were with higher education had high diabetic

health literacy. As well as majority of respondents with elementary school education 31 (22.6%) were with low diabetic health literacy. With x^2 Fisher exact (258.76) 3 cells (20.0%) have expected countless then 5 with p-value .000 which is statistically significant .There is association between DHL and educational status.

Majority of respondents were with average monthly income 20000-50000 had, high diabetic health literacy fallowed by respondents with average monthly income less than 10000, had low diabetic health literacy. With fisher exact value (91.724) 3 cells (25.0%) have expected count less than 5 with p-value (.000) which is statistically significant .There is association between diabetic health literacy and average monthly income. There were 35 (56.5%) respondents on oral hypoglycemic drugs and 10 (16.1%) were on insulin and 17 (24.4%) were on insulin and oral hypoglycemic drugs with high diabetic health literacy fallowed by 50 (36.5%) were on oral hypoglycemic drugs, 36 (26.3%) were on insulin and 51 (37.2%) were on combine insulin and oral hypoglycemic drugs with low diabetic health literacy. x^2 (7.878) p-value (.096) which is not statistically significant. There is no association between treatment regime and diabetic health literacy. There were 28 (90.3%) respondents with family history of diabetes with and 3 (9.7%) were without family history of diabetes had high diabetic health literacy. Fallowed by 100 (61.7%) were without family history of diabetes and 62 (38.3%) were with family history of diabetes had low diabetic health literacy, with x^2 (109.741) p-value (.000) which is statistically significant. There is association between diabetic health literacy with family history of diabetes. There were 10 (32.3%) with duration of diabetes 5-10 years fallowed by 21 (67.7%) respondents were with more than 10 years of disease with high DHL, followed by 123 (75.9%) were with 5-10 years of disease duration and 39 (24.1%) were with more than 10 years of diabetes had low diabetic health literacy. x^2(21.037) p-value (.000) which is statistically significant. There is association between diabetic health literacy and duration of disease. Majority of retired respondents 28 (45.2%) followed by 19 (30.6%) were having their own business and 7 (11.3%) house wife's had high diabetic health literacy. Majority of house wives 75 (54.7%) followed by 57(41.6%) were having their own business had low diabetic health literacy.12 cell (57.1%) have expected count less than 5. Fisher exact value (107.52) p-value (.000) which is statistically significant. There is association between DHL and occupational status. There were 11 (17.7%) respondents without comorbidities fallowed by 51 (82.3%) respondents were with comorbidities had high diabetic health literacy. Followed by 4 (2.9%) without comorbidities and 133 (97.1%) with comorbidities had low diabetic health literacy. 1 cell (16.7%) have expected count less than 5, Fisher exact (12.420) p-value (.002) which is statistically significant. There were 24 (387%) respondents without diabetic complication and 38 (61.3%) respondents with diabetic complications had high diabetic health literacy followed by 25 (18.2%) respondents with no complications and 112 (81.1%) with diabetic complication had low diabetic health literacy. x^2(10.092) p-value (.006) which is not statistically significant .there is no association find between diabetic health literacy and diabetic complication. Social drug history shows majority of respondents had taken tea 44(71.0%) followed by 13 (21.0%) taken tea & cigarette 13(21%) with high diabetic health literacy and 104 (75.9%) were taking tea and 24 (17.5%) were taking tea &

cigarette had low diabetic health literacy .15 cells (17.4%) have expected count less than 17.4%. Fischer exact value (10.848) p-value (.337) which is statistically not significant, there is no association between social drug history and diabetic health literacy.

4.12. Association of Diabetic Health Literacy with Socio-Demographics variables.

Variables	Diabetic Health Literacy			x^2	P-Value
	High	Moderate	Low		
Gender					
Male	49 (79%)	41 (63.1%)	61 (44.5%)	21.977	**0.001**
Female	13 (21%)	24 (36.9%)	76 (55.5%)		
Marital Status					
Married	60 (26.9%)	59 (90.8%)	104(75.9%)		
Single	0 (0.0%)	2 (3.1%)	3 (2.2%)	18.880	**0.001**
Divorced/Widowed	2(3.2%)	4 (6.2%)	30 (21.9%)		
Residency					
Urban	60 (96.8%)	54 (83.1%)	87 (63.5%)	28.291	**0.000**
Rural	2 (3.2%)	11 (16.9%)	50 (36.5%)		
Educational Status					
Elementary School	3 (4.8%)	36 (55.4%)	31 (22.6%)		
High School	36 (58.1%)	19 (29.2%)	0 (0.0%)		
Higher Institute	23 (37.1%)	1 (1.5%)	0 (0.0%)	258.876	**0.000**

Able To Read And Write	0 (0.0%)	3 (4.6%)	2 (1.5%)		
Unable To Read And Write	0 (0.0%)	6 (9.2%)	104(75.9%)		
Average Monthly Income					
<10000	12 (19.4%)	28 (43.1%)	103(75.2%)		
10000-20000	20 (32.3%)	32 (49.2%)	30(21.9%)	91.724	**0.000**
20000-50000	28 (45.2%)	4 (6.2%)	3 (2.2%)		
>50000	2 (3.2%)	1 (1.5%)	1 (0.7%)		
Treatment Regime					
Oral Hypoglycemic agents	35 (56.5%)	28 (43.1%)	50 (36.5%)		
Insulin	10(16.1%)	12(18.5%)	36 (26.3%)	7.878	.097
Insulin+Oral Hypoglycemic agent	17 (24.4%)	25 (38.5%)	51 (37.2%)		
Family History					
No	3 (9.7%)	16 (22.5%)	100(61.7%)	109.741	**0.000**
Yes	28 (90.3%)	55 (77.5%)	62 (38.3%)		
Duration of Disease					
5-10 years	10(32.3%)	44 (62.0%)	123(75.9%)	21.037	**0.000**
More than 10 Years	21 (67.7%)	27 (38.0%)	39 (24.1%)		
Occupational Status					
Private job	8 (12.9%)	5 (7.7%)	5 (3.6%)		
House Wife	7 (11.3%)	21 (32.3%)	75 (54.7%)	107.521	**0.000**
Own business	19 (30.6%)	33 (50.8%)	57 (41.6%)		
Retired	28 (45.2%)	6 (9.2%)	0 (0.0%)		

Comorbidities					
No	11 (17.7%)	6 (9.2%)	4 (2.9%)	12.420	**0.002**
Yes	51 (82.3%)	59 (90.8%)	133(97.1%)		
Complications					
No	24 (38.7%)	14 (21.5%)	25 (18.2%)	10.092	.006
Yes	38 (61.3%)	51 (78.5%)	112(81.1%)		
Social drug History					
None	0 (0.0%)	O (0.0%)	3 (2.2%)		
Coffee	1 (1.6%)	1 (1.5%)	2 (1.5%)		
Tea	44 (71.0%)	45 (69.2%)	104(75.9%)	10.848	.337
Alcohol	1 (1.6%)	0 (0.0%)	0 (0.0%)		
Cigarette	3 (4.8%)	2 (3.1%)	3 (2.2%)		
Tea+ Cigarette	13 (21.0%)	14 (21.5%)	24 (17.5%)		

4.13. Association of Diabetic Medication Adherence with Socio-Demographics Variables.

As shown in table below. There were 24 (77.4%) of male respondents and 7 (22.65) female respondents had good diabetic medication adherence followed by, 86 (53.1%) males and 76 (46.9%) females respondents had low diabetic medication adherence, x^2 (6.305) and p-value (.043) which is greater than (.005) and statistically not significant. There is no association between gender and diabetic medication adherence. There were 29 (93.55) respondents from urban area and 2 (6.5%) respondents from rural had good diabetic medication adherence followed by 116 (71.6%) respondents from urban area and 46 (28.4%) respondents from rural area had poor diabetic medication adherence, x^2(7.296) p-value (.026) which is statistically not significant. There is no association between residency and diabetic medication adherence. Majority of respondents 14 (45.2%) had higher institute education and 13 (41.9%) with high school education had good diabetic medication adherence followed by majority of respondents 91 (56.2%) were unable to

read and write and 50 (30.9%) were with elementary school education had poor diabetic medication adherence, 4 cells (26.7%) have expected count less than 5 the fisher exact value (111.509) p-value (.000) which is statistically significant, there is association between educational status and diabetic medication adherence. There were 11 (35.5%) with monthly income between 20000-50000 and 10 (32.3%) respondents with less than 10000 had good diabetic medication adherence followed by 99 (61.1%) respondents were with monthly income less than ten thousand in Pakistani rupees and 54 (33.3%) with between ten to twenty thousand rupees had poor diabetic medication adherence. Fisher exact (37.431) p-value (.000) which is statistically significant. There is association between monthly income and diabetic medication adherence. There were 21 (67.7%) respondents on oral hypoglycemic drugs and 2(6.5%) on insulin and 8 (24.8%) were on insulin and oral hypoglycemic drugs had good diabetic medication adherence followed by 55 (34.0%) respondents on oral hypoglycemic agents and 45(27.8%) on insulin and 62 (28.3%) on combine insulin and oral hypoglycemic agents had low diabetic medication adherence. x^2(37.431) p-value (.002) which is statistically significant. There is association between treatment regime and diabetic medication adherence. There were 3 (9.7%) respondents with no family history of diabetes and 28 (90.3 %) of respondents with family history of diabetes had good diabetic medication adherence followed by 100 (61.7%) without family history of diabetes and 62 (38.3%) with family history of diabetes had poor diabetic medication adherence. x^2 (48.406) p-value (.000) which is statistically significant.There is association between family history of diabetes mellitus and diabetic medication adherence. Majority of respondents had their own business 13 (41.9%) and 13 (41.9%) respondents were retired from different jobs followed by 3 (9.7%) house wives were high diabetic medication adherence and 72 (44.4%) respondents had their own business and 8 (4.9%) retired respondents followed by 74 (45.7%) were with low diabetic medication adherence. Majority of respondents were 24 (77.4%) taking tea and 4 (12.9%) taking tea and cigarettes had good diabetic medication adherence followed by 114 (70.4%) were taking tea and 34 (21.0%) taking tea and cigarettes had poor diabetic medication adherence. Fisher exact value (9.252) p-value (.637) which is statistically not significant. There is no association between social drug history and diabetic medication adherence.

4.14. Association of Diabetic Medication Adherence with Socio-Demographics Variables.

Variables	Diabetic Medication Adherence			x^2	P-value
	Good DMA	Moderate DMA	Poor DMA		
Gender					
Male	24 (77.4%)	41 (57.7%)	86 (53.1%)	6.305	**0.043**
Female	7 (22.6%)	30 (42.3%)	76 (46.9%)		
Marital Status					
Married	29 (93.5%)	64 (90.1%)	130(80.2%)	7.621	0.078
Single	1 (3.2%)	1 (1.4%)	3 (1.9%)		
Divorced/Widowed	1 (3.2%)	6 (8.5%)	29 (17.9%)		
Residency					
Urban	29 (93.5%)	56 (78.9%)	116(71.6%)	7.296	0.026
Rural	2 (6.5%)	15 (21.1%)	46(28.4%)		
Educational Status					
Elementary School	1(3.2%)	19(26.8%)	50(30.9%)		
High School	13(41.9%)	27(38.0%)	15(9.3%)		
Higher Institute	14(45.2%)	7(9.9%)	3(1.9%)	111.509	**0.000**
Able to read and write	1(3.2%)	1(1.4%)	3(1.9%)		
Unable to read and write	2(6.5%)	17(23.9%)	91(56.2%)		
Average monthly income					
<10000	10(32.3%)	34(47.9%)	99(61.1%)		

10000-20000	7(22.6%)	21(29.6%)	54(33.3%)		
20000-50000	11(35.5%)	16(22.5%)	8(4.9%)	37.431	**0.000**
>50000	3(9.7%)	0(0.0%)	1(.6%)		
Treatment Regime					
Oral hypoglycemic	21(67.7%)	37(52.1%)	55(34.0%)		
Insulin	2(6.5%)	11(15.5%)	45(27.8%)	17.518	**0.001**
Insulin+ Oral hypoglycemic agents	8(24.8%)	23(32.4%)	62(38.3%)		
Family History					
No	3(9.7%)	16(22.5%)	100(61.7%)	48.406	**0.000**
Yes	28(90.3%)	55(77.5%)	62(38.3%)		
Duration of disease					
5-10 years	10(32.3%)	44(62.0%)	123(75.9%)	23.589	**0.000**
More than 10 years	21(67.7%)	27(38.0%)	39(24.1%)		
Occupational Status					
Private job	2(6.5%)	8(11.2%)	8(4.9%)		
House wife	3(9.7%)	26(36.6%)	74(45.7%)		
Own business	13(41.9%)	24(33.8%)	72(44.4%)	55.396	**0.000**
Retired	13(41.9%)	13(18.3%)	8(4.9%)		
Comorbidities					
No	8(25.8%)	6(8.5%)	7(4.3%)	12.905	**0.000**
Yes	23(74.2%)	65(91.5%)	155(95.7%)		
Complications					
No	16(51.6%)	20(28.2%)	27(16.7%)	18.481	**0.000**

Yes	15(48.4%)	51(71.8%)	135(83.3%)		
Social drug history					
None	0(0.0%)	0(0.0%)	3(1.9%)		
Coffee	1(3.2%)	0(0.0%)	3(1.9%)		
Tea	24(77.4%)	55(77.5%)	114(70.4%)		
Alcohol	0(0.0%)	0(0.0%)	1(0.6%)	9.252	.637
Cigarette	1(3.2%)	1(1.4%)	6(3.7%)		
Tea+ Cigarette	4(12.9%)	13(18.3%)	34(21.0%)		

4.15. Association of Diabetic health literacy with Diabetic medication adherence.

As shown in the table below respondents with good DMA had high DHL 23(74.2%) and 2(6.5%) with low DHL followed by moderate DMA had high DHL 26 (36.6%) and 19(26.8%) with low DHL and respondents with low DMA 62 (23.5%) had high DHL and 137 (51.9%) with low DHL. Pearson-chi square value (94.442) and p-value (0.000) which is statistically significant.There is association between diabetic medication adherences with diabetic health literacy.

4.16. Association of Diabetic health literacy with Diabetic medication adherence.

Diabetic Health Literacy

Diabetic Medication Adherence	High	Moderate	Low	x^2	P-value
Good DMA	23(74.2%)	6(19.4%)	2(6.5%)		
Moderate DMA	26(36.6%)	26(36.6%)	19(26.8%)	94.442	**0.000**
Low DMA	62(23.5%)	65(24.6%)	137(51.9%)		

CHAPTER V: DISCUSSION.

Patient's level of diabetes health literacy impacts their ability to manage their condition effectively, including self-care, medication adherence, and seeking appropriate medical attention (Marciano et al., 2019). Poor management of diabetes can lead to inadequate glycemic control and disease progression resulting in diabetes associated complications (Mayer et al., 2016). The primary goal of managing diabetes is to control glucose levels and prevent or delay the onset of diabetic complications. To achieve this, it is essential to increase diabetes literacy, improve medication adherence, and employ other self-care strategies (Yapanis et al., 2022). In Pakistan, no prior studies have explored diabetic health literacy, its correlation with medication adherence.

This study revealed that male respondents scored higher in diabetic health literacy across all three domains (high, moderate, and low) compared to female respondents (Kamuhabwa, A. R., & Charles, E. 2014). Respondents with a family history of diabetes also showed higher diabetic health literacy and medication adherence compared to those without family history of diabetes (Gautam et al., 2015). Furthermore, high and moderate diabetic health literacy was more prevalent among urban residents, while low diabetic health literacy was more prevalent among urban residents, possibly due to factors such as geriatric population, low socioeconomic status, and low education levels. High monthly income respondents had high diabetic health literacy and low monthly income respondents had low diabetic health literacy, and it is also significant DMA (Gautam et al., 2015).

The study reviled that DMA was more in male respondents as compared to females. This contrasts with a study conducted in India by Kumar et al., 2021 which found that female respondents had high DMA. The difference may be attributed to variations in age, education, and socioeconomic status of the respondents.

The study further showed that respondents with a low educational background had low DMA, with 56.2% of those in the low DMA category having low educational attainment. In contrast, 45.2% of those in the high DMA category had completed higher education. This finding is consistent with a study conducted in Iran, which also reported that patients with higher educational backgrounds had higher health literacy scores (Mohammadi et al., 2015). Additionally, respondents with high diabetic health literacy showed higher DMA, while those with low diabetic health literacy showed lower DMA, which is consistent with findings reported by Schönfeld et al. in 2021.

Conclusion: Diabetic health literacy and medication adherence are highly associated. All variables gender, residency, educational status and family history of diabetes mellitus are associated with diabetic health literacy and diabetic medication adherence.

This study identified significant association between educational status and diabetic health literacy. Well educated people were found more adherent to their diabetic medication. Socio-economic status also influenced diabetic health literacy and diabetic medication adherence. Poor people had low diabetic health literacy and diabetic medication adherence. People with family history of DM had better understanding of disease due to exposure to disease previously in the family.

5.2. Strength of the study.

- Study was conducted among geriatric population visiting a tertiary care hospital Rawalpindi.
- Data was collected directly from each study participants in local language for better understanding.
- Sample size was large.
- Specific age range (60 years and above) was recruited for this cross sectional study.

5.3. Limitation of the study.

- It was a cross-sectional study.
- No intervention could be given due to time constrain.
- Results of the study might had been different if diabetic people of all age groups were included.

5.4. Recommendations.

- Diabetic health education programs should be organized on a community level to increase the awareness level in geriatrics.
- People should be encouraged to exercise regularly, and to modify their behavior towards diet and life style
- Health promotion activities should be organized at mohallah and street level.
- Physician should provide comprehensive knowledge and awareness about disease and its risk factors and complications wile treating a diabetic patient, because it can be helpful for successful management of diabetes .It will also help in reducing the communication gap between physicians and patients.
- In tertiary care hospital specific days are allocated for diabetic patients, number of days for diabetic clinic should be increased so that patients can be benefited maximally.

- Uninterrupted supply of medicines should be ensured at hospitals
- Wide variety of anti-diabetic medication should be available at hospital according to the need of diabetic patients.
- Availability of dietitians should be ensured at diabetic clinic for better dietary counselling of diabetic patients.
- Availability of lab staff at diabetic clinic for instant checking of glycemic levels of patients.

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ANNEXURE A.

Name: _____

DEMOGRAPHICS

1. Gender
   a. Male
   b. Female

2. Marital status
   a. Married
   b. Single
   c. Divorced/widowed

3. Residency

   a. Urban
   b. Rural

4. Educational status

   a. Elementary school
   b. High school
   c. Higher institute
   d. Able to read and write
   e. Unable to read and write

5. Average monthly income
   a. <10000
   b. 10000-20000
   c. 20000-50000
   d. >50000

6. Treatment regime
   a. Diet/exercise only
   b. Oral hypoglycemic agent
   c. Insulin
   d. Insulin +oral hypoglycemic agents

7. Family history of DM
   a. Yes

b. No

8.Duration of disease

  c. Less then 5 years
  d. 5-10 years
  e. Greater then 10 years

9.Age _____

1O. Occupational status

  a. Private job
  b. House wife
  c. Own business
  d. Retired

11.Comorbidity

  a. None
  b. Anemia
  c. Arthritis
  d. Chronic kidney disease
  e. Chronic liver disease
  f. Dyslipidemia
  g. Heart failure
  h. HIV
  i. Hypertension
  j. Hypertension + renal disease
  k. Peptic ulcer disease
  l. Stroke

12.Complication

  a. None
  b. Coronary artery disease
  c. Diabetic foot ulcer
  d. Nephropathy
  e. Neuropathy
  f. Peripheral artery disease
  g. Retinopathy

13. Social drug history status
  a. None
  b. Coffee
  c. Tea
  d. Alcohol
  e. Cigarette
  f. Coffee + Alcohol

Diabetic Health Literacy Questions.

1. Read and understand educational materials and booklets
a.   Strongly disagree.   b.   Disagree.   c.   Neutral.   d. Agree.   e.   Strongly agree.
2. Understand the written information provided at the appointment.
a.   Strongly disagree.   b.   Disagree.   c.   Neutral.   d.Agree.   e.   Strongly agree.

3. Comprehend the information I sought on diabetes.

a. Strongly disagree.   b. Disagree.   c. Neutral.   d. Agree.   e. Strongly agree.

4. Understand the information on diabetes management from the health care provider
a. Strongly disagree.   b. Disagree.   c. Neutral.   d. Agree.   e. Strongly agree.

5. Judge if diabetes related information is reliable.
a. Strongly disagree.   b. Disagree.   c. Neutral.   d. Agree.   e. Strongly agree.

6. Calculate the next time to take diabetes medication.
a. Strongly disagree.   b. Disagree.   c. Neutral.   d. Agree.   e. Strongly agree.

7. Determinate the carbohydrate content per serving from the nutrition label.
a. Strongly disagree.   b. Disagree.   c. Neutral.   d. Agree.   e. Strongly agree.

8. Interpret if my blood glucose level is within the normal range.
a. Strongly disagree.   b. Disagree.   c. Neutral.   d. Agree.   e. Strongly agree.

9. Understand information on diabetes presented as probabilities, ratios or on graphs.
a. Strongly disagree.   b. Disagree.   c .Neutral.   d. Agree.   e. Strongly agree.

10. Ask health professional a question.
a. Strongly disagree.   b. Disagree.   c. Neutral.   d. Agree.   e. Strongly agree.

11. Explain my diabetes condition to a health care provider.
a. Strongly disagree.   b. Disagree.   c. Neutral.   d. Agree.   e. Strongly agree.

12. Convey the reason why I should have a diabetic diet.

a. Strongly disagree.   b .Disagree.   c. Neutral.   d. Agree.   e. Strongly agree.

13. Knowing and practicing the appropriate storage condition of diabetic medications.
a. Strongly disagree.   b. Disagree.   c. Neutral.   d. Agree.   e. Strongly agree.

14. Understand all diabetic related medication information.
a. Strongly disagree.   b. Disagree.   c. Neutral.   d. Agree.   e. Strongly agree.

Diabetic medication adherence scale.

Q 1_1	Do you sometimes forget to take your prescribe medicines?	☐ Yes ☐ No
Q 1_2	Over the past two weeks, were there any days when you did not take your prescribed medicine?	☐ Yes ☐ No
Q 1_3	Have you stop taking medication because you feel worse when you took it	☐ Yes ☐ No
Q 1_4	When you travel or leave home, do you sometimes forget to bring along your medicines?	☐ Yes ☐ No
Q 1_5	Did you take your prescribed medicine yesterday?	☐ Yes ☐ No
Q 1_6	When you feel like your health is under control, do you sometimes stop taking your medicine?	☐ Yes ☐ No
Q 1_7	Do you feel hassled about sticking to your prescribed treatment plan?	☐ Yes ☐ No
Total Score		

Urdu Translated Questionnaire.

نام:- --------------------

آبادیاتی

1۔ جنس:-
 a۔ مرد   b۔ عورت

2۔ ازدواجی حیثیت:-
 a۔ شادی شدہ   b۔ اکیلا   c۔ طلاق یافتہ/بیوہ

3۔ رہائش گاہ:-
 a۔ شہری   c۔ دیہی

4۔ تعلیمی حیثیت:-
 a۔ پرائمری سکول   b۔ ہائی سکول   c۔ کالج   d۔ پڑھ لکھ سکتا ہے   e۔ پڑھ لکھ نہیں سکتا

5۔ ماہانہ آمدنی:-
 a۔ دس ہزار سے کم   b۔ دس ہزار سے بیس ہزار   c۔ بیس ہزار سے پچاس ہزار   d۔ پچاس ہزار سے زیادہ

6۔ علاج کے طریقہ کار:-
 a۔ صرف غذا اور ورزش   b۔ کھانے والی ادویات   c۔ انسولین   d۔ انسولین + کھانے والی ادویات

7۔ خاندان میں زیابیطس کی موجودگی:-
 a۔ ہاں   b۔ نہیں

8۔ زیابیطس کا دورانیہ:-
 a۔ پانچ سال سے کم   b۔ پانچ سے دس سال   c۔ دس سال سے زیادہ

9۔ عمر: --------------------

10۔ پیشہ ورانہ حیثیت:-
 a۔ نجی ملازمت   b۔ گھر یلو خاتون   c۔ اپنا کاروبار   d۔ ریٹائرڈ

11۔ دیگر امراض:-
 a۔ کوئی نہیں   b۔ خون کی کمی   c۔ جوڑوں کی تکلیف   d۔ پرانی گردوں کی بیماری   e۔ پرانی جگر کی بیماری
 f۔ خون میں چکنائی کی زیادتی   g۔ قلب کی ناکامی   h۔ ایڈز   i۔ فشار خون   j۔ فشار خون + گردوں کی بیماری
 k۔ آنتوں کا السر   l۔ فالج

12۔ پیچیدگیاں:-
 a۔ کوئی نہیں   b۔ شریانے کلب کی بیماری   c۔ زیابیطس سے متاثر پاؤں کا زخم   d۔ گردے کا مرض
 e۔ عصبی عارضہ   f۔ شریان کی بیماری   g۔ پردہ بصارت کی بیماری   h۔ فالج

13۔ سماجی منشیات کی تاریخ:-
 a۔ کوئی نہیں   b۔ کافی   c۔ چائے   d۔ الکوحل   e۔ تمباکو نوشی   f۔ کافی + الکوحل

زیابیٹس صحت خواندگی کے سوالات

۱۔ تعلیمی مواد اور کتابچے پڑھنا اور سمجھنا۔
a۔ بہت زیادہ اختلاف   b۔ متفق نہیں   c۔ غیر جانبدار   d۔ متفق   e۔ بہت زیادہ متفق

۲۔ ملاقات کے وقت فراہم کردہ تحریری معلومات کو سمجھنا۔
a۔ بہت زیادہ اختلاف   b۔ متفق نہیں   c۔ غیر جانبدار   d۔ متفق   e۔ بہت زیادہ متفق

۳۔ میں نے زیابیٹس کے بارے میں جو معلومات مانگی ہیں اُس کو سمجھنا۔
a۔ بہت زیادہ اختلاف   b۔ متفق نہیں   c۔ غیر جانبدار   d۔ متفق   e۔ بہت زیادہ متفق

۴۔ معالج کی زیابیٹس کو قابو کرنے کے بارے میں معلومات کو سمجھنا۔
a۔ بہت زیادہ اختلاف   b۔ متفق نہیں   c۔ غیر جانبدار   d۔ متفق   e۔ بہت زیادہ متفق

۵۔ زیابیٹس سے متعلق معلومات قابل اعتماد ہیں پر کہہ سکتے ہیں۔
a۔ بہت زیادہ اختلاف   b۔ متفق نہیں   c۔ غیر جانبدار   d۔ متفق   e۔ بہت زیادہ متفق

۶۔ زیابیٹس کی دوا لینے کے لیے اگلی بار کا حساب لگائیں۔
a۔ بہت زیادہ اختلاف   b۔ متفق نہیں   c۔ غیر جانبدار   d۔ متفق   e۔ بہت زیادہ متفق

۷۔ غذائیت کے لیبل سے فی سروٹنگ کاربوہائیڈریٹ مواد کا تعین کریں۔
a۔ بہت زیادہ اختلاف   b۔ متفق نہیں   c۔ غیر جانبدار   d۔ متفق   e۔ بہت زیادہ متفق

۸۔ تشریح کریں کہ آیا میرے خون میں گلوکوز کی سطح نارمل حد کے اندر ہے۔
a۔ بہت زیادہ اختلاف   b۔ متفق نہیں   c۔ غیر جانبدار   d۔ متفق   e۔ بہت زیادہ متفق

۹۔ زیابیٹس کے بارے میں معلومات کو سمجھیں جو ان کا نات، تناسب، یا گراف پر ظاہر کی گئی ہیں۔
a۔ بہت زیادہ اختلاف   b۔ متفق نہیں   c۔ غیر جانبدار   d۔ متفق   e۔ بہت زیادہ متفق

۱۰۔ معالج سے ایک سوال پوچھیں۔
a۔ بہت زیادہ اختلاف   b۔ متفق نہیں   c۔ غیر جانبدار   d۔ متفق   e۔ بہت زیادہ متفق

۱۱۔ میری زیابیٹس کی حالت کو معالج کو وضاحت کریں۔
a۔ بہت زیادہ اختلاف   b۔ متفق نہیں   c۔ غیر جانبدار   d۔ متفق   e۔ بہت زیادہ متفق

۱۲۔ وہ بتائیں مجھے زیابیٹس کی خوراک کیوں لینی جا ہے۔
a۔ بہت زیادہ اختلاف   b۔ متفق نہیں   c۔ غیر جانبدار   d۔ متفق   e۔ بہت زیادہ متفق

۱۳۔ زیابیٹس کی دوائیوں کے ذخیرہ کرنے کے مناسب حالات کو جاننا اور اس پر عمل کرنا۔
a۔ بہت زیادہ اختلاف   b۔ متفق نہیں   c۔ غیر جانبدار   d۔ متفق   e۔ بہت زیادہ متفق

۱۴۔ زیابیٹس کے متعلق تمام ادویات کی معلومات کو سمجھیں۔
a۔ بہت زیادہ اختلاف   b۔ متفق نہیں   c۔ غیر جانبدار   d۔ متفق   e۔ بہت زیادہ متفق

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ادویات کی پابندی کا پیانہ

۱۔ کیا آپ کبھی کبھی اپنی زیابیٹیس کی دوا لینا بھول جاتے ہیں۔

ہاں   نہیں

۲۔ پچھلے دو ہفتوں سے کوئی ایسا بھی دن گزرا ہے کہ آپ نے اپنی تجویز کردہ دوائی نہیں لی۔

ہاں   نہیں

۳۔ کیا آپ نے کبھی اپنی دوا یاں لینا بند کر دی ہوں آپ کو محسوس ہو رہا ہو کہ دوایوں سے آپ کی طبیعت زیادہ خراب ہو رہی ہو۔

ہاں   نہیں

۴۔ جب آپ سفر کرتے ہیں یا گھر سے نکلتے ہیں کیا آپ کبھی اپنی دوا لانا بھول جاتے ہیں۔

ہاں   نہیں

۵۔ کیا آپ نے کل اپنی تمام دوایاں لی تھی۔

ہاں   نہیں

۶۔ جب آپ کو لگتا ہے کہ آپ کی علامات قابو میں ہیں تو کیا آپ کسی وقت اپنی دوائی لینا بند کر دیتے ہیں۔

ہاں   نہیں

۷۔ کیا آپ اپنے تجویز کردہ علاج کے منصوبہ پر قائم رہنے میں پریشانی محسوس کرتے ہیں۔

ہاں   نہیں

Informed Consent Form.

Diabetic Health Literacy And Medication Adherence Among Geriatrics With Type 2 Diabetes Mellitus Visiting Tertiary Care Hospitals Of Rawalpindi City.

Assalam-o-Aaikum

My name is Dr Sajid Abbas. I am student of Al-shifa School of Public Health, Rawalpindi. I am doing research on diabetic health literacy and medication adherence among geriatrics type 2 diabetes mellitus in tertiary care hospitals of Rawalpindi.

This research will involve two questionnaires to be filled in by respondents. I will keep all your information confidentially and will not disclose information collected from you. It will be use in public interest. Your participation in this research will be voluntarily and honor for me. It is your choice whether to participate or not .You can quite this study at any part however I hope you will answer all the questions.

You can ask any further question regarding research.

If you agree with me to participate in this research kindly undersign the consent form. But if you wish to participate without written consent in that case verbal consent is also acceptable.

Thank You.

Signature

ANNEXURE C.

Proposed Timeline (Gantt chart)

Task	Sep 1	Sep 2	Sep 3	Sep 4	Oct 1	Oct 2	Oct 3	Oct 4	Nov 1	Nov 2	Nov 3	Nov 4	Dec 1	Dec 2	Dec 3	Dec 4	Jan 1	Jan 2	Jan 3	Jan 4	Feb 1	Feb 2	Feb 3	Feb 4
Synopsis Writing & IRB Approval	■	■	■																					
Literature Review		■	■	■																				
Pilot Testing						■	■																	
Data Collection								■	■	■														
Data Analysis													■	■	■									
Thesis Write Up											■	■	■	■	■	■	■	■						
Thesis Defence																						■	■	

Sep 2022 - Feb 2023

Proposed Budget

BUDGET ITEM	TRANSPORT	STATIONERY & INTERNET	PRINTING	PUBLISHING
QUESTIONAIRE	Rs. 7000	Rs. 4000	Rs. 8000	
PILOT STUDY	Rs. 3000	Rs. 2000	Rs. 2000	
DATA COLLECTION	Rs. 6000	Rs. 2000		
THESIS WRITEUP	Rs. 3000	Rs. 7000	Rs. 5000	Rs. 7000
TOTAL EXPENDITURE	Rs. 19,000	Rs. 15,000	Rs. 15,000	Rs. 7000
GRAND TOTAL	Rs. 56,000			

AL-SHIFA SCHOOL OF PUBLIC HEALTH
PAKISTAN INSTITUTE OF OPHTHALMOLOGY
AL-SHIFA TRUST, RAWALPINDI

TO WHOM IT MAY CONCERN

This is to certify that **Sajid Abbas** S/O **Habib Ul Hasnain** is a student of Master of Science in Public Health (MSPH) final semester at Al-Shifa School of Public Health, PIO, Al-Shifa Trust Rawalpindi. He/she has to conduct a research project as part of curriculum & compulsory requirement for the award of degree by the Quaid-i-Azam University, Islamabad. His/her research topic which has already been approved by the Institutional Review Board (IRB) is **"Diabetic health literacy and medication adherence among geriatrics with type 2 diabetes mellitus visiting tertiary care hospitals of Rawalpindi city"**.

Please provide his/her necessary help and support in completion of the research project. Thank you.

Sincerely,

Dr. Ayesha Babar Kawish
Head
Al-Shifa School of Public Health, PIO
Al-Shifa Trust, Rawalpindi

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