

**INVESTIGATING THE ROLE OF HEALTH LITERACY IN MEDICATION
ADHERENCE AMONG OLDER ADULTS WITH CHRONIC DISEASE IN
PESHAWAR**

**PROGRAM
BS-PUBLIC HEALTH**

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01-152221-021

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Acknowledgments

To begin with, my gratitude and satisfaction to Almighty Allah (SWT), through His immensely infinite blessings, strength and wisdom, which enabled me to have the ability, knowledge and perseverance to fulfil this challenging process of research. It is all praise and gratitude to Him.

I owe my kind parents an immense debt as my anchor in this process and unchanging moral support, unconditional support and prayers were the main pillars of my path. They had always inspired me with their faith in me.

Last but not the least, I would like to give an immensely large credit to my supervisor, Dr. Sidra Shahid.

Abstract

This study investigated the role of health literacy in medication adherence among older adults (aged 55 years and above) with chronic diseases in Peshawar, Pakistan. A significant issue in society is poor medication adherence, which is also one of the primary contributors to complications that are preventable, unnecessary admissions, and medical expenses. The survey was a quantitative and cross sectional survey involving 399 older adults, who were recruited through healthcare institutions in Peshawar. Health literacy was determined by means of the Brief Health Literacy Screening (BHLS), and medication adherence was evaluated by 8-item Morisky Medication Adherence Scale (MMAS-8). According to the descriptive findings, medication adherence was mainly low (Low: 64.9%, Medium: 22.1%, High: 13.0%), and health literacy was largely low in the sample (Limited: 50.1%, Marginal: 24%, Adequate: 26%). Chi-square test indicated that health literacy and medication adherence are strongly related and significantly ($p = 0.001$) accurate. Limited health literacy levels were associated with significantly elevated chances of low adherence (100% of participants with limited HL had low adherence) although adequate literacy levels gave rise to a rather higher level of adherence. All statistical analyses were performed using SPSS version 27. The article results determine that poor health literacy is a significant health concern that prevents effective medication when applied to elderly people with chronic diseases. To enhance medication adherence and chronic disease control in Pakistan, the study has indicated that specific and culturally sensitive health literacy programs, with the help of the framework like the Health Belief Model, can be used to positively affect the main issue.

Keywords: *Health Literacy, Medication Management, Medication Adherence, Chronic Disease, Self-efficacy, BHLS, MMAS-8.*

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Chapter 1: Introduction

1.1 Background of the Study

Such chronic conditions as diabetes, hypertension, cardiovascular disorders, and kidney diseases are one of the leading health burdens in the world especially in old age (World Health Organization [WHO], 2021). Such conditions are lifelong and must be managed by strictly following medication regimes as the best control and prevention measure of complications. The use of medications is thus a critical factor in the results of specific treatments but studies invariably indicate that the elderly are one of the most non-compliant populations in the world (Berkman et al., 2011; Sabate, 2003). Non-adherence is a cause of preventable hospitalization, a decrease in quality of life and high medical expenses (Jimmy and Jose, 2011).

In the low resource setting like Pakistan, the socioeconomic factors, low education level, and poor healthcare systems add to the challenges in adherence (Ashiq and Asad, 2017). In this context, health literacy as the capacity to acquire, interpret, and comprehend simple health data is at the center stage of influencing medication behaviors (Nutbeam, 2008). The older demographic with low levels of health literacy experiences difficulties in taking medication prescriptions, schedules, adverse reactions, and locating medical care, which contributes to the increased incidences of medication errors and noncompliance (Berkman et al., 2011; Kripalani et al., 2010).

The city of Peshawar is located in the Khyber Pakhtunkhwa province where population age is rapidly increasing, chronic disease burden remains very high and health literacy levels are historically low (Khan et al., 2022). In spite of the same, there is limited research studies on the relationship between health literacy and medication adherence among older adults in Pakistan. The gap reveals the necessity of specific empirical research with the standardized and validated instruments.

This need becomes even more pressing when considering the speed at which chronic diseases are increasing among older adults in regions like Peshawar. As the population ages, the demand for continuous medication use rises, and with it the importance of understanding the factors that influence adherence (WHO, 2021). Older adults are required to manage complex treatment regimens that often include multiple medications, strict timing, and lifestyle adjustments (Boyd et al., 2005). Without the ability to fully comprehend these requirements, adherence becomes inconsistent and error-prone. In such circumstances, health literacy acts as a foundational skill that

shapes how individuals interpret, evaluate, and apply medical information (Nutbeam, 2008). When this skill is weak, the entire structure of chronic care becomes unstable.

In low-resource environments, these challenges are magnified due to limitations of the healthcare system. Consultation times are extremely short, and physicians may not have the opportunity to explain treatment instructions clearly or in simplified language (Kripalani et al., 2010). Many older patients hesitate to ask questions due to cultural norms or fear of appearing uninformed (Shaikh & Hatcher, 2005). As a result, misunderstandings remain unaddressed. These misunderstandings often translate directly into missed doses, incorrect dosing, or early discontinuation of medication (Jimmy & Jose, 2011). Over time, these patterns contribute to worsening disease outcomes, avoidable hospitalizations, and increased financial burden on both families and healthcare systems (Javed et al., 2020).

Furthermore, chronic diseases in older adults are not isolated conditions. Many individuals live with two or more long-term illnesses requiring simultaneous management (Pati et al., 2015). Diabetes and hypertension frequently coexist, and both demand disciplined self-monitoring, dietary adjustments, and accurate medication intake (Khan et al., 2022). Individuals with low health literacy may struggle to differentiate between medications, understand their purpose, or recognize symptoms that require urgent care (Berkman et al., 2011). This inability to navigate essential health information creates a cycle where limited health literacy leads to poor adherence, and poor adherence leads to worsening clinical outcomes (Paasche-Orlow & Wolf, 2007).

The situation in Peshawar is particularly significant because of the unique combination of linguistic diversity, cultural expectations, and socioeconomic challenges. Many older adults primarily speak Pashto, yet most prescription labels and hospital discharge instructions are provided in Urdu or English (Akhtar et al., 2015). This linguistic disconnect further complicates comprehension, especially for individuals already experiencing difficulty reading or interpreting medical information. As a result, even routine medication instructions become difficult to follow without assistance. Moreover, family members who serve as informal caregivers may also have limited health literacy, which compounds the problem and reduces the likelihood of consistent medication management (Zeng et al., 2020).

Given these realities, health literacy plays a central role in shaping day-to-day medication behaviors. It influences patients' ability to perceive their illness accurately, understand the

consequences of non-adherence, and recognize the benefits of sustained treatment (Schillinger et al., 2002). It also affects their confidence in managing medications independently, which ultimately determines the success or failure of long-term treatment plans (Bandura, 1997). By investigating how health literacy influences medication adherence specifically in the context of older adults in Peshawar, this study provides essential insight into a topic that has not been examined in the local research landscape.

Such context-specific research is necessary for developing targeted interventions that reflect the realities of the population. Evidence generated through standardized and validated tools can guide healthcare providers in identifying individuals at risk of poor adherence and implementing strategies that are culturally sensitive, linguistically accessible, and easy to understand (Weiss, 2007). This will not only support older adults in managing chronic diseases more effectively but also strengthen public health efforts aimed at reducing complications and improving the overall quality of life for this vulnerable group.

1.2 Research Problem and Gap Identification

Even though health literacy is becoming more effectively identified by global literature as a predictive of medication adherence, a number of gaps still exist. Most of the research done previously is confined to high-income nations or urbanized, well educated people, so there is little research on older adults living in poor literacy environments. Moreover, different definitions and measurement instruments apply to health literacy, which brings to different results about the relation of the latter with adherence. Behavioral issues like inability to understand instructions, voluntary withdrawal or forgetfulness are under-researched in the developing nations.

In Pakistan (especially in Peshawar), there is little quantitative data that has been conducted examining the relationship between health literacy and medication adherence among elders with chronic diseases. This gap in the research is critical because it has not been done locally thus the gap in knowledge that will be filled in this study.

1.4 Research Objectives

1. To evaluate the level of health literacy and day-to-day medication adherence behaviors.
2. To assess the effect of health literacy on medication adherence.

1.5 Research Questions

1. What is the level of health literacy among older adults (aged ≥ 55) with chronic diseases in Peshawar?
2. How is health literacy associated with medication adherence in this population?

1.6 Significance of the Study

The contribution of health literacy to medication adherence in enhancing the outcomes of chronic diseases in older adults has been critical to comprehend. Health literacy has limited levels, which are a risk factor that can be changed and hence an intervention can be directed to it. The results of the present research are important as they demonstrate that the study provides important evidence from an under-researched population in Pakistan, offering insights that fill a critical gap in the local literature. It highlights health literacy as a key determinant of self-management behaviors among older adults with chronic diseases. This emphasizes its central role in shaping daily treatment practices. The findings also support healthcare professionals in adopting literacy-sensitive communication strategies. That can improve patients' understanding and medication adherence. Moreover, the study informs public health policy by underscoring the need to integrate routine health literacy assessments into clinical practice to better identify at-risk individuals. Finally, it contributes theoretical depth by applying the Health Belief Model (HBM) to explain how health literacy influences perceptions, decision-making, and overall medication adherence behaviors.

The implications of these contributions on practice are that the design of culturally relevant interventions that enhance adherence among older adults has possibilities of simplified labeling of medications, pictorial aids, and community-based interventions based on education to enhance compliance.

Chapter 2: Literature Review

2.1 Importance of Health Literacy in Chronic Disease Management

Health literacy is a growing concept that is being identified as a determinant of health behavior with respect to the required medication with chronic diseases among the older adults. Learning and responding to health information is mandatory in the continuity of treatment regimes, but many elderly people can do it because of insufficient literacy levels. Research findings have always demonstrated that low health literacy is a contributor to medication mismanagement, and that older people tend to misunderstand dosage regimen or deliberately overlook the significance of adhering to medication regimen. This is especially worrying considering that aging is already associated with cognitive and physical issues that can increase the adherence. A number of studies have identified the compounded risks these adults are exposed to as low health literacy interacting with age-related decline leading to the end result of not being able to handle treatment regimens as a result of the compounded risks. (Berkman et al., 2011; Kripalani et al., 2010).

2.1.1 Health Literacy and Medication Management

The second common theme in the literature is miscommunication between the patient and the healthcare provider. Failure to fully comprehend the purpose of taking medications or taking the drugs in the correct way results in poor adherence by patients. It has been found that low levels of literacy is a significant obstacle to effective communication in the health care environment. Low-literacy patients have fewer chances of asking questions and obtaining clarification, resulting in medication error. This has been experienced both locally and internationally thus reinforcing the point of the idea that it is a prevalent issue and not restricted to the particular region. Adherence has been measured using tools such as the Morisky Medication Adherence Scale and findings tend to indicate a very strong relationship between low literacy and non-uniformity in medication taking concerning behavior. (Ngho, 2009; Al-Qazaz et al., 2010).

2.1.2 Cognitive Understanding and Treatment Compliance

Beyond the narrow studies on health literacy and adherence, the broader literature reviews and meta-analyses have investigated the relationship between the two. These articles confirm the idea that enhanced literacy goes through enhanced medication habits, and focus on the importance of cognition in influencing treatment adherence among individuals. As an example, the better level of recognizing the drug schedule, the level of medication side effects awareness, and the level of

confidence in self-management are associated with the high rate of literacy. This trend is reinforced by systematic reviews, which point to the fact that literacy is not only a knowledge problem but also a behavioral one with health implications in the real world. (Paasche-Orlow & Wolf, 2007).

2.1.3 Intervention Strategies To Bridge The Literacy Gap

Things done to enhance compliance tend to include interventions that make the communication less complex or the utilization of visual communication to overcome the literacy barrier. Criticisms indicate that these strategies may be useful, but most of the interventions have not been well-evaluated, and it is not easy to make a conclusive finding about their survival. Although the tools and frameworks have been provided, implementation is usually disjointed, or lacks proper evaluation. The lack of sustainable, evidence-based practices in this domain is an indication that more may be required of more systematized research addressing how low-literate group populations receive and process medication information. (DeWalt et al., 2010; Conn et al., 2016).

2.1.4 Practical Barriers: Polypharmacy and Complex Regimens

There are other barriers presented to older adults such as practical obstacles such as polypharmacy and complicated drug regimes. Most of them have cognitive barriers, which with the lack of communication by the medical personnel lead to misinterpretation or uninitiated medication. The systematic reviews demonstrate that it is particularly challenging to work with multiple medications even among patients whose health literacy is lower in general, and this fact generally results in poorer health outcomes in the long term. Such validated instruments as the Test of Functional Health Literacy in Adults (TOFHLA) have played a key role in determining who is at risk of non-adherence with low scores being a reliable indicator of problems in understanding and following medication instructions. (Gellad et al., 2011; Parker et al., 1995).

2.1.5 Expanding the Definition of Health Literacy

Other researchers have broadened the concept of health literacy with respect to mere reading. According to them, functional literacy is not the whole picture, interactivity and critical literacy, the power to operate in a system and make wise decisions are also crucial. This is particularly so of the oldsters who might be required to communicate with more than one healthcare provider. Though, these higher levels of health literacy tend to be ignored by the rest of the population in health interventions, and this creates a rift between the needs of the patients and the support of the entire system. (Nutbeam, 2008; Williams et al., 2002).

2.1.6 Evolution of the Health Literacy Construct

The idea of health literacy has developed considerably, as compared to the early nineties (Zarcadoolas et al., 2005). However, at the very beginning, HL was outlined mostly as functional literacy with its emphasis put on the basic reading and numeracy abilities needed by a patient to operate in a healthcare workplace (Kickbusch, 2008). Later models have added the interactive and critical literacy (the ability to manage information and apply it to changing situations and critical analysis of information and come up with complex autonomous health decisions respectively (Nutbeam, 2000). Health literacy is currently perceived as a multidimensional concept of a complex of both personal competences and the complexity and expectancies of the healthcare system as such, which has given rise to the idea of the literacy-demanding environment. (DeWalt & Hink, 2009).

2.1.7 Measuring Health Literacy: Tools and Categorization

Proper evaluation of HL is essential in determining at-risk groups (Paasche-Orlow & Wolf, 2007). Although more detailed tests such as the Test of Functional Health Literacy in Adults (TOFHLA) are thorough, they are not applicable to clinics due to time constraints (Parker et al., 1995). Short screening instruments, including the Brief Health Literacy Screening (BHLS), which were used in this research, are a viable alternative (that has shown to have high levels of correlation with longer scales) (Weiss, 2007). With the help of the BHLS, patients can be classified into Limited, Marginal and Adequate literacy levels; the directly related assessed capacity to the possible health behavior. The fact that the mean BHLS score of 12.30 (SD=4.763) found in the study implies that the population has low to marginal literacy (Khan, 2025) and preconditions the issues with adherence that have been identified.

2.2 Chronic Disease Epidemiology in the Older Population

The unprecedented increase in the absolute number of older adults (age 55 years) on a global level has occurred due to the world-wide shift to an ever-increasing life expectancy (the so-called global demographic transition). Older age is associated with increased NCDs, such as hypertension, diabetes, or cardiovascular diseases (CDC, 2022). They are frequently combined and slow down to polypharmacy and very complicated treatment regimens (Boyd et al., 2005). Epidemiological transition is rapidly happening in such areas as South Asia, putting the health care resources at a high load (Pati et al., 2015). Treatment and care in managing patients necessitates long term

changes in lifestyle and more importantly regular pharmacological efforts (Pradhan et al., 2025). This burden can be seen in the study sample, although Diabetes and Hypertension are the most common.

2.2.1 Regional Evidence Linking Health Literacy to Diabetes Management

The concept of health literacy has been one of the most important factors in the management of chronic diseases like type II diabetes by individuals. In a more recent cross-sectional study of Mercy Teaching Hospital in Peshawar, health literacy was significantly associated with an improved adherence to both medicine and non-medicine management interventions. The researchers involved 242 patients (with an average age of 55) in the research and applied the Chronic Disease Self-Management Program (CDSMP) and the knowledge-based questionnaire to determine compliance and glycemic control based on the recent HbA1c outcomes. Having a high internal consistency (Cronbach- $\alpha = 0.88$), the research highlighted that those who better understood their condition had a greater probability of following treatment plans. These results underline the importance of health education in helping with diabetes self-management and the need for it to be applied in low-literacy, resource scarce environments such as Peshawar. (Khan et al., 2022).

2.2.2 The Interrelation of Multimorbidity and Polypharmacy Complexity

Although polypharmacy is a recognized obstacle, the influence it has on adherence is multiplied by the number of pills in the pharmacologic regimen, which does not necessarily depend on the number of pills (Marcum et al., 2012). Complexity is created by dosing frequency (e.g., three times a day or once a day), non-standard timing (e.g., 'with food' or 'one hour before bedtime') as well as the existence of special instructions (e.g., 'crush tablets'). It has always been found that the higher the complexity of the regimen, the lower the adherence rate, which puts an overwhelming strain on already-taxed cognitive capacity of older adults with low HL (Marcum et al., 2012). This aspect is especially pertinent in multi morbid population, in which hypertension and diabetes treatment plans tend to be incompatible.

2.2.3 Consequences: Health Literacy as a Predictor of Hospital Readmission

Among the greatest social health impacts of low HL and not adhering, there is the risk of **hospital readmission**. Research work, specifically with patients with chronic conditions such as Heart Failure certainly proves that limited HL is a predictive variable on its own in regards to 30-day all-

cause readmission and emergency department visits (Howard et al., 2013). Governed by the fact that the patient cannot comprehend complicated discharge information, effectively complete self-management procedures (such as medication reconciliation), and monitor early disease progression, all the skills being directly affected by low HL, such a relationship makes the situation. (Howard et al., 2013).

2.2.4 The Economic Catastrophe of NCDs in Pakistan

Hampered by the high cost of medicine in Pakistan, which has been identified numerous times as a main cause of non-adherence, leads to a first-order issue of disastrous health spending in the treatment of NCD (Javed et al., 2020). With the healthcare system in Pakistan majorly dependent on out-of-pocket payments, chronic disease treatment subjects many families that have low incomes to poverty. This acute economic burden compels patients, especially those with low HL unable to negotiate the subsidy options, to ration or stop medication, and this system-wide constraint has been converted into a choice of non-compliance.(Javed et al., 2020).

2.3 Defining and Measuring Medication Adherence

Medication adherence is a very popular concept whose definition has not been universally agreed upon (Osterberg and Blaschke, 2005). The definition of adherence by the World Health Organization considers adherence as the level to which an individual lays his actions, e.g., taking medication, in accordance with the accepted guidance by the health care provider (WHO, 2023). The non-adherence may be classified into primary (failing to filling up the first prescription) and secondary (quitting or changing the regimen after the first fill) (Vrijens et al., 2012). Secondary non-adherence is especially pertinent to the elderly who have to cope with chronic diseases.

2.3.1 Empirical Evidence: Health Literacy as a Barrier to Medication Adherence

The literature had a lot of evidence to support the positive correlation between low health literacy and low medication adherence in different chronic conditions (Sorensen et al., 2012). This current trend is well in line with the global trend found to be statistically significant between BHLS category and MMAS-8 adherence in the current study. ($\chi^2 = 257.828$, $P < 0.001$) (Khan, 2025).

2.3.2 Cardiovascular Disease and Hypertension

The studies carried out on cardiovascular patients unanimously reveal that low HL is an inhibitor of patient perception of medication intention, dose changes, and non-adherence consequences (Peterson et al., 2011). In a meta-analysis of hypertensive patients, limited literacy was associated with decreased chances of identifying the correct name of medications and being able to articulate the treatment regimen, thus, making the awareness of blood pressure control worse (Krousel-Wood et al., 2009; Gazmararian et al., 2010). In particular, poor health literacy compromises the management of the complex regimen of several classes of drugs (e.g., ACE inhibitors, beta-blockers, and diuretics), typical of elderly patients having co-morbidities of hypertension and heart diseases. It is very pertinent to the current study considering that 37.1 percentage of the sample was hypertensive.

2.3.3 Diabetes Management and Insulin Therapy

The level of health literacy is especially important in patients with diabetes because complex self-management activities that extend beyond taking pills are required, such as glucose monitoring, diet, and, in some cases, administration of insulin (Schillinger et al., 2002). According to studies, poor glycemic control, by way of high HbA1c levels, is directly linked to low HL that adversely leads to poor adherence to drug treatment and lifestyle guidance (Fransen et al., 2019). Low numeracy and prose literacy to read and follow the instructions given on syringes and pens used to deliver insulin is a critical safety risk in the patient (Williams et al., 1998). Since the highest rate of the disease in the study was Diabetes (57.4) [Source: 9], the relationship between the variables, HL, and MA is urgent of association since lack of proper adherence results in expensive and incapacitating diabetic problems. (Ho et al., 2006).

2.3.4 The Intersection of Age, Cognition, and Literacy

The triple burden of age, chronic disease procedures, and widespread low literacy is experienced by older adults (Insel et al., 2015). Even without clinical dementia age-related alterations may impact the speed of processing and working memory, complicating the acquisition of new information particularly when the interaction is only short-term with a healthcare setting (Deary et al., 2013). This is further aggravated by low health literacy since it diminishes the redundancy required to enhance successful recall and application of information (Baker et al., 2002). It is

highly recommended that both age-related cognitive decline and underlying literacy deficits should be tackled by the interventions so as to work with this group of people.

2.3.5 The Unclear Relationship: Heterogeneity in Systematic Reviews

Although a positive relationship was found in most single studies, systematic reviews prove that the total relationship between health literacy and medication adherence is complicated and sometimes inconclusive because the methodological heterogeneity is high (Koster et al., 2018; Ngho, 2009). There have been mixed reviews with some, (some with no others with few) getting a positive relationship, none, and some even getting mixed results. The common cause of this heterogeneity is due to different measurement tools (e.g., performance-based vs. self-report HL measures), different cut-offs to differentiate between adherence and literacy categories across research studies (Koster et al., 2018; Vrijens et al., 2012). The complexity of this point supports the fact that localized, focused quantitative research, like the one underway in Peshawar based on standardized measures, like the BHLS and MMAS-8, is needed to clarify the relationship in a specific high-risk population to reduce methodological confounding.

2.4 Socioeconomic Determinants and Health Disparities

Populations do not have equal health literacy (Rootman and Gordon-El-Bihbety, 2008). It is highly influenced by the socio-economic factors (SES), the educational level, and the location (Shi et al., 2020). In less developed, low-income, middle-income countries (LMICs) such as Pakistan, the low levels of formal education are common, and are directly related with the low levels of functional and numerical literacy. This systemic challenge is highlighted by the demographics of the study in which a large portion of the sample is either in the Primary, Matriculation, or Intermediate level of education [Source: 9]. Limited HL is a mediator around which the translation of socio economic deprivation into poor health outcomes takes place. (Braveman et al., 2010).

2.4.1 Cultural and Linguistic Barriers in Healthcare

Health communication is fraught with complexity in multilingual and multicultural places like Peshawar (the study location [Source: 9]) where there are diverse cultures. The materials provided by patients while educating them are frequently in a standard language (e.g., Urdu or English), which may not be the primary language of language used by older people (e.g., Pashto) (Akhtar et al., 2015). Also, cultural expectations of patient-physician communication that can be deferential to the physician may preclude patients questioning the physician and conceal lack of literacy

(Shaikh and Hatcher, 2005). This power relationship also undermines the efficiency of medication counseling which results in direct conflict and non-compliance directly. (Jones & Lannon, 2020).

2.4.2 System-Level Failures and the 'Literacy-Demanding' Environment

Even the healthcare systems themselves are not necessarily able to adjust to the literacy level of people who they cater to (Speros, 2005). Among the malpractices of this aspect, some have been identified as the confusing and jargonized consent forms, prescription labels filled inadequately, and rushed consultation time (Weiss and Palmer, 2004). A truly health-literate organization is aware of the role of good communications that resides within the system and not within the patient (Brach et al., 2012). Have an overly literacy-demanding environment contributes to prescribing mechanisms, which are, however, not standardized and can be easily read and understood, and instructions during discharge, which adds to resource-limited settings simplification and further literacy-demanding nature, effectively guarantee non-adherence among those with marginal or limited skills (Institute of Medicine, 2004). The only finding made in the research is the wretched correlation between low HL and low MA (where there are 200 persons with Limited HL Low Adherence is a resounding indictment of this challenging level of the system setting).

2.4.3 Evidence from Non-Western/Asian Healthcare Settings

Although there is an overall relationship between HL and MA across the globe, studies which are specific to the different Asian countries are very relevant to the study in Peshawar. The association between the literacy status and the functional outcomes was directly corroborated by a study of older adults with chronic disease in Korea which observed that inadequate HL was common (30.8% of participants) and was related to worse self-reported mobility and general activities (Yoo et al., 2020). Likewise, a Malaysian study had shown that with multi morbid elderly populations, low health literacy linked to non-adherence to medication among other variables such as high treatment burden and chronic conditions number (Sav et al., 2013). These results underline the idea that even though healthcare systems are different, cognitive requirements of chronic care management are a universal hindrance of low literacy older people in Asia.

2.4.4 Contextual Barriers in Pakistani Older Adults: Forgetfulness and Cost

Research specific to older adults in **Pakistan** confirms that non-adherence is highly attributable to patient-related and financial factors, which are often compounded by low literacy (Siddiqui et al., 2024). Studies in Pakistan consistently identify **forgetting to take medication** (up to 61.9% of

residents in one study) and **cost** (up to 92.7% of patients reporting cost as a factor) as primary challenges (Khan et al., 2025; Hussain et al., 2019; Saleem et al., 2020). Low health literacy exacerbates forgetfulness because patients lack the comprehension needed to develop effective mental models or use reminder systems correctly, while low income and limited education are directly linked to low HL and cost-related non-adherence. Furthermore, significant proportions of patients reported **stopping medication** when they felt better, a decision often rooted in a lack of critical literacy and poor understanding of chronic disease prognosis.

2.4.5 Challenges of Cross-Cultural Health Literacy Measurement

A significant methodological challenge in cross-cultural research is the **conceptual equivalence** of standardized HL measures (Jordan et al., 2011). Tools developed for Western English speakers (e.g., TOFHLA) may not accurately capture functional skills or social dynamics in a Pashto-speaking, high-context culture like Peshawar. The translation process must ensure not only linguistic accuracy but also **cultural relevance** (Jordan et al., 2011). The use of the BHLS, a simplified screening tool, attempts to mitigate these issues by focusing on basic comprehension skills relevant to medication use, rather than complex prose or numeracy tasks.

2.4.6 Qualitative Insight: Traditional Beliefs and Intentional Non-Adherence

In Pakistan and other South Asia territories, medication adherence is prone to the influence of **traditional and spiritual beliefs**, which leads to deliberate non-adherence (Hussain et al., 2021). Qualitative research has found that the beliefs of patients include a belief that modern medicines are hot (creating internal heat, and this is inconsistent with some traditional disease etiologies) or that a long-term period of using medication will cause addiction and kidney damage. These irrational fears are combined with low critical literacy and amplified (Perceived Barriers) and cause patients to purposely lower or discontinue medication, although high-quality medical care can be provided (Hussain et al., 2021). This cultural aspect is a severe context facet of the Peshawar study.

2.4.7 The Critical Role of Caregiver Health Literacy

The compliance of the patient in non-Western environment where older adults can mostly reside in extended family units is not entirely dependent on the literacy of the patient. The health literacy of a primary caregiver or a family member is a variable that tends to have a significant predictive effect on whether a patient will adhere to the provided advice (Zeng et al., 2020). A systematic

review discovered that caregiver HL serves as a buffer in response to poor patient HL, whereby where the patient has limited skills, an adherent caregiver will fill the gap by taking control of drug timeframes, navigating the system, and interacting with providers. This social supporting mechanism is important to take into account in developing interventions in the communities assuming low literacy. (Zeng et al., 2020).

2.4.8 The Influence of Emotion and Affect on Adherence

Lastly, a key aspect of modern studies is that emotion and affective states also serve as modifying factors when it comes to the adherence process and these factors are usually disregarded by the purely cognitive models (Webster et al., 2017). Patients who have low HL also often note increased fear, anxiety, and frustration regarding their regimen (Webster et al., 2017). This status emotion burden disrupts the process of rational decision making (Perceived Benefits/ Barriers) and it frequently results in avoiding behavior (non-adherence). Effective communication should therefore not be limited to passing cognitive information but also ensuring confirmation and consideration of the emotions that are initiated by the disease and its intricate treatment.

2.5 Interventions and Policy Implications from Global Literature

The robust link between HL and MA has spurred the development of targeted interventions and policy recommendations globally (Sorensen et al., 2012).

2.5.1 Communication Strategies: Teach-Back and Universal Precautions

The best intervention thus far evidenced to help in alleviating the impact of low HL is adoption of the so called "Universal Precautions" condition of communication wherein the assumption towards taking into consideration all patients who, perhaps due to having low HL, cannot easily comprehend health information (Institute of Medicine, 2004). The key component here is the Teach-Back Method in which, the provider requests the patient to paraphrase the instructions (Schillinger et al., 2003). It has been demonstrated that this approach enhances recall, understanding, and, therefore, compliance among different groups of patients (Coleman et al., 2017). Nevertheless, it is only possible to successfully densify in conditions of high volume and low-resource settings such as Peshawar on the condition of professional healthcare worker training and altering the time spent on consulting.

2.5.2 Simplifying Medication Information

Simplifying written and visual medication aids is essential (Doak et al., 1996). This includes: **Simplified Labeling:** Using large, clear fonts, limiting jargon, and employing easily understood pictograms to convey dose and frequency (Kripalani et al., 2007). **Visual Aids and Pill Organizers:** Utilizing pill boxes, color-coded schedules, and culturally relevant visual cues to assist older adults who may struggle with numerical or time-based instructions (Rothman et al., 2004). **Interactive Digital Tools:** While access is a barrier in LMICs, the development of simple, voice-activated or pictorial-interface mobile applications (in local languages) is a promising area for improving medication literacy and adherence reminders (Neter et al., 2020).

2.5.3 Systemic and Policy Interventions

In addition to personal patient-provider relationships, there should be changes on the policy levels (DeWalt and Hink, 2009). The literature proposals are the use of national standards in health information clarity, compulsory health literacy education in medical and nursing curricula, and the introduction of special community health workers (CHWs) to provide specific and repeated health education in the local language in a community (Brach et al., 2012). The results of the Peshawar study and specifically the correlation between the Limited HL and the Low MA (where 50.1% of the total sample fell in the Limited HL/Low Adherence bracket) can be a powerful motivating factor to the health ministry in the region to emphasize these systemic transformations.

2.5.4 The Role of Digital Literacy and Treatment Burden in Adherence

Health literacy is multidimensional not only in its ability to comprehend print, but also including an area like digital health literacy (DHL), an even more important skill to manage chronic conditions in the contemporary era (Norman & Skinner, 2018). DHL can be explained as the ability to search, locate, interpret, and evaluate electronic-based health information that is usually essential in handling refill notifications, telehealth, and prescription data. The literature dedicated to older adults indicates that low DHL has the power to hinder self-care practices to an exhausting degree even under the conditions of decent traditional functional literacy (Neter et al., 2020). At the same time, with low medication adherence among multi morbid older adults, there is a strong relationship between the notions of treatment burden, the time, effort, and resources that patients are expected to allocate to dealing with their disease states (Eton et al., 2012; Sav et al., 2013). Polypharmacy and complex the timing of chronic conditions impose a high burden on the

treatment process, and low health literacy is an important factor that prevents the successful process of treatment and management of this burden, which in turn results in poor adherence.

2.5.5 Digital Health (mHealth) Interventions as Scalable Solutions in LMICs

The high non-adherence rate caused by reported forgetfulness in Pakistan implies that, as an intervention, digital health solution (mHealth) interventions in the form of low-cost and high-reach text message (SMS) reminders will be highly applicable intervention (Saleh et al., 2020). Simple, automated text messages, frequently in the local language, have demonstrated itself as effective in increasing adherence to chronic disease medication in low- and middle-income countries (LMICs) and has been shown to provide a scalable solution to the Cues to Action construct of the HBM. (Saleh et al., 2020).

2.5.6 Mediation via Patient-Provider Trust and Communication Quality

The quality of patient-provider relationship is a significant mediator of the relationship between HL and MA and it is trust. Patients with enhanced HL are able to have superior communication, pose specific inquiries, and co-manage their care, and the result is high perceived quality of care and trust in the plan of care by the provider (Mackey et al., 2020). Low-HL patients, in turn, who often feel pressured, misled, or blamed, attain low trust, which is also reflected in low adherence because they will tend to devalue the recommended benefits or overstate the perceived barriers (Mackey et al., 2020). This posits a critical as well as relational pathway that systemic HL interventions need to address.

3. Theoretical Framework: The Health Belief Model (HBM)

In an effort to get over the correlation between HL and MA, this paper relies on the Health Belief Model (HBM) in offering a theoretical background to the behavior (Janz and Becker, 1984). The HBM is a socio-psychological theory that posits and forecasts health behavior and is centered on the issue of attitudes and beliefs of the subjects. (Rosenstock, 1966).

3.1 Core Constructs of the HBM and Medication Adherence

The HBM posits that a patient's decision to adhere to a medication regimen is influenced by six primary constructs: Perceived Susceptibility, which is the belief that one is personally at risk of developing or worsening a disease (e.g., risk of heart attack if blood pressure is uncontrolled) (Champion & Skinner, 2008); Perceived Severity, the belief regarding the seriousness of the

disease and its potential consequences (e.g., the belief that a stroke is severely debilitating) (Becker et al., 1974); and Perceived Benefits, the belief in the effectiveness of the advised action (medication) to reduce the disease threat (e.g., "This pill will definitely lower my blood sugar") (Ajzen, 1991).

The model also includes Perceived Barriers, the belief concerning the obstacles, costs, or side effects of taking action (e.g., cost of medicine, inconvenient dosing schedule) (Bandura, 1997); Cues to Action, which are factors that trigger the readiness to take action (e.g., a reminder from a family member, a television advertisement) (Conner & Armitage, 1998); and finally, Self-Efficacy, the conviction that one can successfully execute the necessary behavior (e.g., confidence in remembering to take all medications daily) (DiMatteo et al., 2004).

3.2 Health Literacy as a Critical Modifying Factor in the HBM

Health literacy functions as a fundamental modifying factor that mediates and modulates all the core perceptual constructs of the Health Belief Model (HBM). This influence starts with the Impact on Perceived Threat (Susceptibility & Severity): individuals with limited health literacy (HL) often cannot accurately read lab results, understand disease progression mechanisms, or grasp the full implications of their diagnosis. Consequently, without this cognitive understanding, the perceived threat (both susceptibility and severity) of non-adherence is significantly diminished, which often leads to complacency. Furthermore, low HL directly impairs the ability to weigh the Perceived Benefits against the Perceived Barriers. For instance, a patient with limited literacy may not understand why a medication takes time to work (Benefits) but will immediately recognize and overemphasize side effects or cost (Barriers). Lastly, HL has a critical Impact on Self-Efficacy, which is likely the most direct association. Adhering to medications requires the patient to believe they can successfully fit the complicated regimen into their daily life. Low HL challenges this assumption directly by rendering the regimen itself impossible to comprehend. This results in the patient feeling overwhelmed and helpless, leading to a profound reduction in adherence self-efficacy and subsequent non-adherence.

3.3 Health Literacy and Self-Efficacy: The Core HBM Link

Self-efficacy is the strongest psychological mediator of the relationship of health literacy and adherence, which is an element of the core construct of the Health Belief Model (HBM) (Bandura, 1997). It has been shown in studies on different chronic diseases such as heart failure and diabetes

that health literacy is the prerequisite to the formation of strong self-efficacy (Gazmararian et al., 2010; Williams et al., 1998). Limited Health Literacy patient is not able to process effectively the information related to his or her disease or treatment and this basically lacks the confidence (self-efficacy) that they have the ability to perform the required self-care tasks like taking the medication on time or knowing the side effects (Paasche-Orlow & Wolf, 2007). On the other hand, HL interventions have been found to directly increase self-efficacy, which, in turn, affects other areas of better self-care and adherence to medication (Schrack et al., 2014). This emphasizes the fact that merely giving information is insufficient because there should be the power given to the patient of utilizing such information to develop confidence.

3.4 Health Literacy and Cognitive Load Theory

In addition to the psychological considerations presented in the HBM, a lack of Health Literacy (HL) has been known to result in a suffocating amount of cognitive load where the interaction between a patient and a healthcare professional occurs (Schillinger et al., 2004). According to cognitive load theory, the working memory of an individual may be overwhelmed by the mental processes necessary to process new information, including the need to maintain its complex dosing schedule, dietary restrictions, and side-effect management because of age-related cognitive decline (Ryan and Deci, 2017). When the cognitive load of a medication regimen (therapy factor) surpasses the capacity of a patient (limited HL), they tend to turn to passive or non-compliant behavior to minimize cognitive load, which accounts for most adherence problems being described by unintentional forgetfulness and not intentional defiance. (Zhong et al., 2023).

Chapter 3: Methodology

The research design used in this study was quantitative and cross-sectional to research the relationship between health literacy and medication adherence among elderly with chronic conditions in Peshawar. The quantitative version of the research was considered the most suitable type of research as the main goal was to calculate and statistically analyze changes in health literacy and adherence rates with the help of standardization scales. It was efficient, cost-effective and appropriate to determine associations between variables in a large population since the cross-sectional design enabled the collection of data at a single point in time. It is a common kind of design in the field of public health research, in which the researcher aims to discover trends and correlations among a certain population (Creswell & Creswell, 2018). The selection of a quantitative design has made the study objective, reproducible, and able to provide inferential tests including chi-square test that is employed in the current study.

3.1 Method of Data Collection

Structured data were employed in the study by using interviewer-administered questionnaires because the content was clear and relevant to the objectives of older adults since most of them have low literacy levels. Data collection occurred in different healthcare facilities and in outpatient clinics, tertiary hospital and community health programs both in urban and semi-rural cities of Peshawar. The face-to-face survey reduced error in the responses as well as enabled the subject to seek clarification which is very essential especially in evaluating constructs like health literacy and medication adherence.

The new characteristic of this research was the utilization of a developed web application that was specifically created with the purpose of the real-time data entry and effective survey administration. The researcher came up with this internal application to facilitate the process of collection and capture accurate and immediate responses by the participants. This method was particularly useful when using ageing participants, which minimized the burden of information and exertion involved in traditional paper surveys.

The web application had a number of integrated functions. To begin with, it included the entire informed consent form that was signed on a digital format, at the beginning of every session. Thanks to the verbal administration of the consent information, participants were informed about it and provided the consent directly in the app. This guaranteed standardized, ethical and safe

process of obtaining informed consent. Second, the researcher translated all the items in the questionnaire (BHLS and MMAS-8) into Urdu or Pashto when administering the questionnaire. The app has offered a computerized framework of the instruments, which enabled the Researcher to concentrate only on providing the correct and culturally informed verbal interpretations. Third, since respondents gave oral answers, the researcher would key them in instantly and directly in the application interface. This has removed the necessity of manual-entry, minimized the possibility of data-entry mistakes, and guaranteed quality and real-time digital recording of all responses.

The use of this web-based tool in data collection processes has contributed to the ethical compliance, increased efficiency, reduced loss of data, and augmented the general reliability and validity of the dataset.

3.2 Conceptualization

Health Literacy is the cognitive and social skills that enable individuals to access, understand, and use health information ; and **Medication Adherence** is the extent to which patients take medications as prescribed.

3.3 Operationalization

Health Literacy in this study was operationally defined and assessed using the Brief Health Literacy Screening (BHLS) tool. The BHLS is an efficient, four-item screening tool designed for clinical and research settings, capturing essential functional literacy components. Scores on the BHLS range from 4 to 20 , and participants were categorized into three distinct levels: Limited Health Literacy (scores from 4–12), Marginal Health Literacy (scores from 13–16), and Adequate Health Literacy (scores from 17–20).

Medication Adherence was measured using the 8-item Morisky Medication Adherence Scale (MMAS-8). The MMAS-8 is an eight-item, self-report instrument that evaluates medication-taking behaviors , including elements such as forgetfulness, intentional discontinuation, and difficulty following medication instructions. The responses generate a score which is categorized into three levels of adherence: Low Adherence (scores less than 6), Medium Adherence (scores from 6 to less than 8), and High Adherence (a score of 8).

Both instruments were translated into **Urdu and Pashto** to accommodate local language needs. Translations underwent expert review and back-translation to ensure accuracy. A pilot test

involving 20 participants was conducted to assess clarity, cultural appropriateness, and comprehension. Minor linguistic adjustments were made based on participant feedback.

3.4 Area Profile and Research Participants

The experiment was done in the capital of Khyber Pakhtunkhwa, Peshawar, having a diverse population and high rates of chronic diseases. The healthcare availability is varied and the area of healthcare is rich to investigate the medication performance of the older adults. In the publicly owned hospitals, clinic centers privately owned and local health organizations, access was possible to a large demographic representation.

The sample was determined as older adults aged 55 and above who were determined to be associated with any of the chronic conditions diagnosed with diabetes, hypertension, cardiovascular disease or arthritis. All the participants were required to have been using at least one of the medications given to them on the day of study.

3.5 Population Frame, Inclusion, and Exclusion Criteria

The population frame consisted of older adults receiving ongoing treatment for chronic diseases in healthcare facilities across Peshawar.

The study's inclusion criteria required participants to be Adults aged 55 years and above, diagnosed with at least one chronic disease, on regular medication for the condition, and able to provide informed consent. Conversely, the exclusion criteria specified that participants could not include individuals with diagnosed cognitive impairments (e.g., dementia), patients with untreated or undocumented chronic conditions, or individuals unable to complete the survey even with support². These criteria were implemented to ensure the sample accurately represented older adults actively managing chronic diseases, thereby aligning with the study's primary objective.

3.6 Sampling Technique and Sample Size

A purposive sampling method was employed to pick the participants who passed the criterion of eligibility of the study intentionally. The reason to use purposive sampling was the fact that it was only through people that are actively controlling chronic diseases and have an active medication regimen that health literacy and medication adherence will be found meaningful. This approach was not probability and this preceded the inclusion of pertinent cases hence the findings mean a lot about the target population. The sample size was determined using Slovin's Formula

Using a population estimate of 243,891 older adults (Pakistan Bureau of Statistics, 2021) and a margin of error of 5%, the required sample was approximately 399 participants, which aligns with the final achieved sample. This sample size provides sufficient statistical power for detecting associations between categorical variables using chi-square testing.

3.7 Data Analysis

Data were coded, entered, and analyzed using Statistical Package for the Social Sciences (SPSS) Version 27. A comprehensive analysis plan was followed: Frequencies, percentages, means, and standard deviations, summaries of socio-demographic variables, distribution of BHLS and MMAS-8 scores.

To evaluate the relationship between health literacy and medication adherence, a Pearson Chi-Square test was conducted. This test was appropriate because both variables were measured categorically (e.g., Limited vs. Adequate HL; Low vs. High adherence). Statistical significance was set at $p < 0.05$, though results showed much stronger significance ($p < 0.001$), indicating a robust association.

3.8 Ethical Considerations

This study was approved by a institutional review board of Bahria University Islamabad with regards to its ethical nature. All the participants were informed about the study and given consent before the data collection began with efforts made to make sure the informed consent was understood when the literacy levels varied. The participants were guaranteed that they will remain anonymous, willingly participate, and have an opportunity to pull out at any point without any penalty. Privacy was ensured by anonymizing and retaining data in a secure place.

CHAPTER 4: Results

The chapter provides the result of the study using the responses of the 399 older adults (55 years and above) with chronic conditions living in Peshawar. The chapter is divided into three large parts (1) demographic features of the sample, (2) descriptive findings on the key variables of the main study, and (3) inferential analysis of the relationship between health literacy and medication adherence.

4.1 Demographic Characteristics of Participants

A total of 399 participants completed the survey. The demographic profile includes gender, age, education level, and type of chronic disease. These characteristics are summarized in Table 1.

Table 1: Demographic Characteristics of Participants (N = 399)

Demographic variable	Category	Frequency (n)	Percentage %
Gender	Female	144	36.1
	Male	255	63.9
Age Group	55-65	230	57.6
	66-75	159	39.8
	76-85	10	2.5
Education	Primary	82	20.6
	Matriculation	125	31.3
	Intermediate	121	30.3
	Undergrad	71	17.8
Disease	Diabetes	229	57.4
	Hypertension	148	37.1
	CHD	21	5.3
	CKD	1	0.3
Location	Peshawar	399	100.0

The majority of the sample consisted of males (63.9%). Most participants were aged **55–65 years (57.6%)**, followed by **66–75 years (39.8%)** and **76–85 years (2.5%)**. Educational attainment varied, with matriculation (31.3%) and intermediate (30.3%) being the most common levels. Diabetes (57.4%) and hypertension (37.1%) were the predominant chronic diseases reported.

4.2 Descriptive Analysis

Descriptive statistics were computed for the two primary variables: Medication Adherence (MMAS-8) and Health Literacy (BHLS). The results are presented in Table 2.

Table 2 Descriptive Statistics for MMAS-8 and BHLS Scores (N=399)

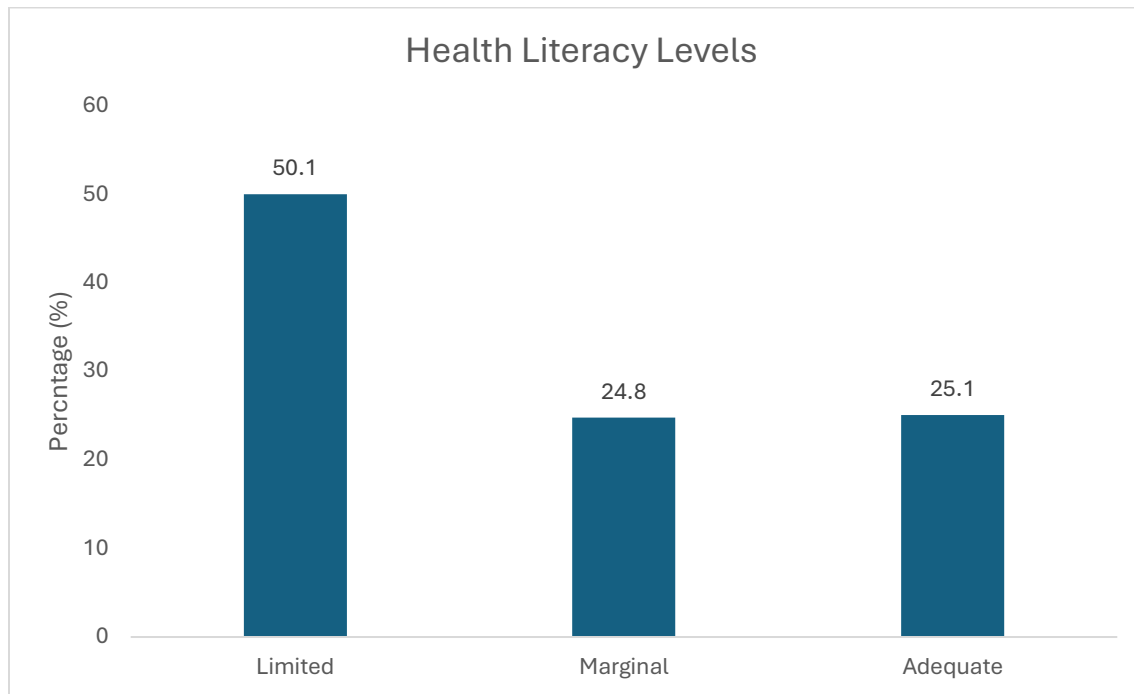
	Mean	Std. Deviation
Medication Adherence	5.1429	1.99645
Health Literacy	12.30	4.763

The mean medication adherence score was **5.14 (SD = 1.996)**, indicating generally low adherence across the sample. The mean health literacy score was **12.30 (SD = 4.763)**, reflecting predominantly limited to marginal health literacy levels among participants.

4.3 Distribution of Health Literacy Levels

Participants' BHLS scores were categorized into Limited, Marginal, and Adequate health literacy. The distribution of these categories is illustrated in Figure 1.

Figure 1 Distribution of Health Literacy Levels

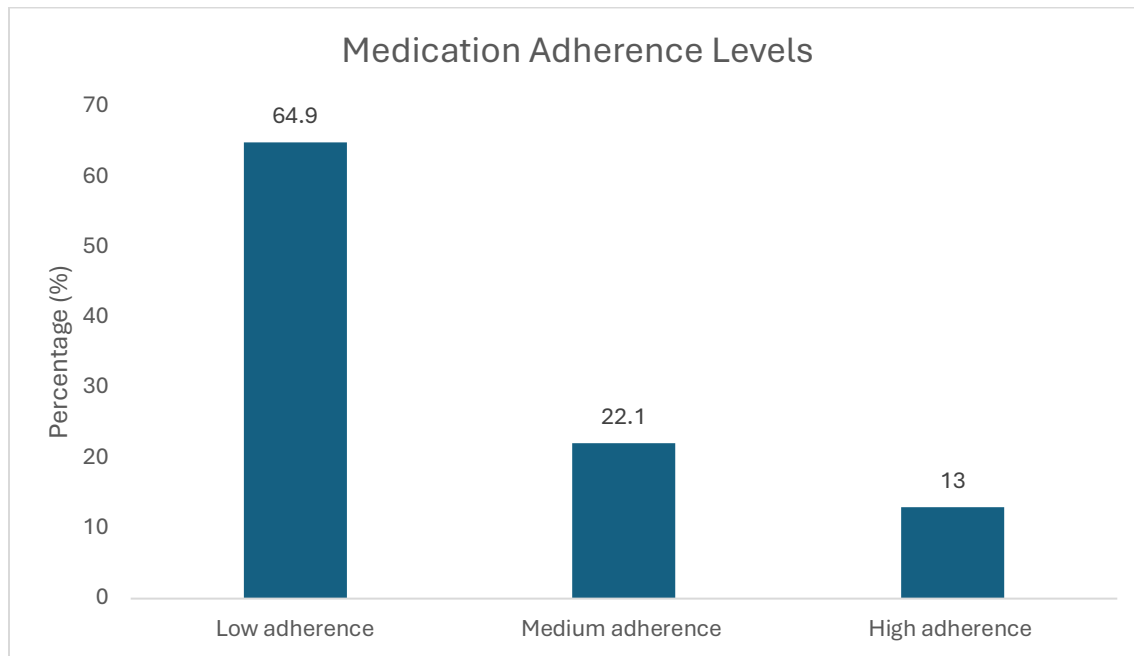


Half of the respondents (50.1%) fell within the Limited Health Literacy category, followed by Marginal and Adequate literacy groups. This distribution highlights a substantial literacy challenge within the elderly population of Peshawar.

4.4 Distribution of Medication Adherence Levels

Medication adherence levels, measured through the MMAS-8 scale, were categorized into Low, Medium, and High adherence. These findings are depicted in Figure 2.

Figure 2 Distribution of Medication Adherence Levels



The analysis revealed that Low adherence was most common, particularly among participants with limited literacy. Medium adherence was more prevalent in the marginal and adequate literacy groups, while high adherence was observed primarily among individuals with adequate health literacy.

4.5 Association Between Health Literacy and Medication Adherence

A Chi-Square test was conducted to assess the association between health literacy categories and medication adherence levels. The results are displayed in Table 3.

Table 3 Association Between Health Literacy and Medication Adherence

Health Literacy Level	Low Adherence (n)	Medium Adherence (n)	High Adherence (n)	Chi-Square	P-value
Limited	200	0	0		
Marginal	12	47	40		
Adequate	47	41	12	257.828	<0.001

The chi-square analysis yielded a statistically significant association between the two variables ($\chi^2 = 257.828$, $p < 0.001$). Notably, all participants with **Limited Health Literacy** demonstrated **Low Medication Adherence**, while those with **Adequate Health Literacy** showed higher proportions of Medium and High adherence. This confirms the theory that health literacy significantly influences medication-taking behavior in older adults.

CHAPTER 5: Discussion

In this chapter, the results of this study are placed within the context of the current literature, theoretical approach and the local environment of the older population in Peshawar. The research involved the role of health literacy in medication adherence among older adults with chronic diseases and established that the two variables were strongly and statistically related to one another. The discussion is designed to be based on the key findings of the research, their correspondence to the previous studies, as well as the contribution to theory, practice, and policy.

The findings support the assumption that most older adults in Peshawar have a poor health literacy level with two hundred out of the three hundred and ninety-nine participants fitting within the lowest literacy level. The level of medication adherence was also poor in general with the average of MMAS-8 (5.14) depicting an optimum adherence behavior. The most important result was that health literacy was significantly correlated with medication adherence ($\chi^2 = 257.828, p < 0.001$), as all the participants in the low literacy group exhibited poor adherence.

The results are corroborated by international evidence that the health literacy is among the best predictors of adherence in terms of long-term therapies in the case of older adults (Berkman et al., 2011; Kripalani et al., 2010). The implication of this is immense, as it suggests that health literacy could be one of the leverage points in terms of improving chronic disease management in the low-resource environment like in Peshawar.

Limited health literacy was also found to be very high during this study due to increased frequencies of the same levels of health literacy in Pakistan, in general, when the general level of literacy is low, and health education is scarce (Ashiq and Asad, 2017). The same result has been observed in other developing and middle-income nations (LMICs), where the elderly population tends to have light or no formal education and non-exposure to the information about health (Nutbeam, 2008; WHO, 2021).

The result also confirms the studies of Khan et al. (2022), who discovered that the patient population with chronic diseases in Peshawar had poor knowledge about medical guidelines and wellness. Therefore, this paper supports the issue regarding the fact that elderly people in Pakistan have to deal with various literacy-related issues, which have a direct influence on their ability to cope with chronic diseases.

The poor medication adherence rates in this research are comparable with the world evidence that adherence when taking long-term therapy reduces with age with specific populations with multiple comorbidities and low education levels (Sabate, 2003). Poor adherence in the elderly has been found to increase hospitalization, healthcare expenditure, and complications of the disease that can be avoided. (Jimmy & Jose, 2011).

In Pakistan, the lack of literacy is the cause of medication adherence and structural determinants include the scarcity of consultation time, large number of patients in government hospitals and inadequate use of communication in between the physician and patient (Kripalani et al., 2010). These are factors which are probable factors that led to adherence difficulties as experienced in this study.

The observed high correlation between health literacy and medication adherence is in line with Mayo-Gamble and Mouton (2017) who revealed that older adults with low health literacy tend to misunderstand instructions on the dosage, drop out of medications, or even miss taking medications because of the inability to understand the significance of a treatment. The same correlations were found in the works by Geboers et al. (2015), Cutilli (2007), and the terms of health literacy are as the main in the behavior of taking medication.

It is also worth noting that all participants who reported limited and low adherence levels had low levels of health literacy. Such a trend highlights the magnitude of the literacy barrier and recommends that traditional drug counseling techniques might not be efficient enough in the people with a low level of comprehension. It also emphasizes the relevance of culturally proper and language competent patient education interventions in clinical practice.

To gain insight into the manner in which health literacy affects adherence behaviors, the Health Belief Model (HBM) is a helpful tool. The HBM presumes that the perceptions of susceptibility, severity, benefits, barriers, cues to action, and self-efficacy influence health behaviors among people (Rosenstock et al., 1988).

Individuals with limited literacy often underestimate the seriousness of chronic diseases or fail to understand the consequences of poor adherence (Williams et al., 2002). This can be the reason that low health literacy members of the study had low adherence because they might not consider that their condition is severe enough to dictate regular taking of medication.

Health literacy must be sufficient, and this needs to increase the capacity of a patient to learn the advantage of taking medication. This is in line with the results of the study that indicates greater adherence of people with sufficient literacy.

Poor health literacy works as an obstacle in the HBM model. Lack of adequate knowledge on instructions, side effects or post-use conditions will encourage them to either avoid medication routines or prescribe them improperly.

Health literacy is a significant factor that contributes to self-efficacy, confidence to control own condition. The individuals who were well literate showed better adherence which may be due to the fact that they felt that they had more abilities to handle their treatment. The findings facilitate the idea that health literacy enhancement can positively affect various elements of the HBM, hence, improving medication adherence.

It was likely that they were affected by culture and socioeconomic conditions of a unique environment, Peshawar. There is a low level of interaction and contact with the healthcare providers thus older adults in the region may depend on family members in managing their medications. The language spoken by physicians is usually in technical terms that the elderly cannot comprehend and this creates confusion in the dosage and frequency. Moreover, the number of patients in public hospitals continues to be congested, which limits the amount of time to conduct counseling. The above contextual issues enhance the effects of low health literacy and justify the need to provide local-specific interventions that could address the needs of elderly patients in Peshawar.

5.1 Limitations

This study has several limitations that should be acknowledged. The use of a cross-sectional design limits the ability to establish causality between health literacy and medication adherence. The findings indicate an association, but they cannot determine the direction of the relationship or capture changes over time. The study relied on self-reported measures, which may be affected by recall bias or social desirability, especially among older adults who may hesitate to disclose difficulties with understanding or following medical instructions. The sample was limited to older adults attending selected healthcare facilities in Peshawar, which may restrict the generalizability of the results to older individuals who do not frequently seek medical care or who reside in rural and remote areas. Cultural and linguistic differences within the population may also have

influenced the accuracy of responses despite efforts to provide clarification during data collection. Additionally, the study did not assess other potential factors that may influence adherence. Such as caregiving support, medication affordability, or the complexity of treatment regimens. These unmeasured variables may have contributed to variations in adherence but were beyond the scope of the current research. Despite these limitations, the study provides important insights into the relationship between health literacy and medication adherence among older adults in Peshawar and highlights areas for future investigation.

5.2 Implications of the Findings

The results of this paper carry great clinical implications to clinical practice especially in the management of chronic diseases in the elderly. The close relationship between health literacy and adherence to medication is proof of the necessity of healthcare providers to consider limited literacy one of the primary obstacles to successful care. To ensure effective communication clinicians should apply literacy sensitive communication strategies which include plain language use, use of culturally sensitive educational resources, and the teach back method to achieve comprehension. By integrating short-term health literacy measures, including the BHLS, into the daily clinical interaction, it is possible to find people who need extra assistance. Additionally, pharmacists and nurses have a significant complementary role of complementing and strengthening medication instructions, adherence follow-ups, and counseling. To increase adherence behavior and overall health outcomes in chronic disease older adults, there is a strong need to improve communication throughout the care point.

5.3 Implications for Public Health Policy

The implications of the results of the study with regard to the public health policy in Pakistan are also important. Limited health literacy among older adults represents a large percentage and thus highlights the need to focus on institutionalized health education programs. It should be the priority of the policy-makers to create easily available health information sources in the Urdu and Pashto language, so that the populace awareness about health issues is easy, culturally sensitive, and comprehensible to people with diverse literacy levels. These initiatives can be further enhanced by enhancing the training of healthcare workers to enable them to have a conversation with the patient in a more patient-centered manner. Healthy communities and families could be empowered through community based interventions on health literacy through health literacy workshops,

caregiver education programs and local awareness campaigns that can be incorporated into the current health systems. An approach to health literacy as a structural determinant of health would help reduce complications that are preventable, decrease health care spending, and help all stakeholders in the region to manage their chronic diseases.

5.4 Implications for Future Research

Lastly, the findings provide some guidelines as to how future studies can be conducted. Although there is a good relation between health literacy and medication adherence, longitudinal studies should be done to determine the causal direction and should measure an effect over time. Intervention based research may also explore more research on the effectiveness of interventions aimed at enhancing health literacy, e.g. simplified medication labels, pictorial dosing schedules, or electronic literacy devices that are older adults friendly. The qualitative research would also offer a greater depth of understanding of the lived experiences among the older adults, their beliefs and struggles to learn to manage their health conditions. Through this type of research, the evidence base would be further enriched and inform the creation of more focused, contextual specific intervention to combat both cognitive and structural barriers to adherence. The implication of all these is that health literacy is instrumental to the management of chronic diseases and that it should be incorporated in the future research agendas.

6. Conclusion

This study examined the role of health literacy in medication adherence among older adults with chronic diseases in Peshawar. The findings clearly demonstrate that health literacy is a decisive factor in shaping medication-taking behavior in this population. Most participants exhibited limited health literacy, and this directly corresponded with low levels of adherence to prescribed medications. The analysis established a strong and statistically significant association between the two variables, confirming that individuals with limited literacy were far more likely to engage in inconsistent and incorrect medication practices.

The results are consistent with global and regional evidence showing that low health literacy undermines the understanding of disease severity, treatment instructions, and long-term self-management. In Peshawar, these challenges are intensified by limited education, cultural norms, linguistic barriers, and the constraints of an overburdened healthcare system. These factors collectively reduce the ability of older adults to follow treatment guidance, increasing the likelihood of preventable complications, hospitalizations, and declining quality of life.

The study reinforces the need to integrate routine health literacy assessment into clinical practice, especially in settings serving older populations. It also highlights the importance of adopting simplified, culturally appropriate communication strategies that support patients with limited literacy. Strengthening the role of caregivers and improving patient-provider communication are equally essential in enhancing adherence.

Overall, the findings emphasize that improving health literacy is not only an educational goal but a crucial component of chronic disease management. Addressing literacy-related barriers has the potential to significantly improve medication adherence, reduce disease complications, and promote healthier aging in Peshawar. The study contributes important local evidence for future public health planning and underscores the value of designing interventions that are sensitive to both the cognitive and contextual needs of older adults.

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Questionnaire

Informed Consent Form

Study Title: Investigating The Role Of Health Literacy in Medication Adherence Among Older Adults With Chronic Disease in Peshawar.

Researcher: Salar Khan, BS Public Health, Bahria University Islamabad

Email: Salar202@gmail.com

Purpose of the Study

This study aims to understand the role of health literacy in medication adherence among older adults with chronic disease.

Participation

You will be asked to complete a short questionnaire. Participation is entirely voluntary, and you may choose to withdraw at any time without any consequences.

Confidentiality

Your responses will remain completely anonymous and confidential. No identifying information will be recorded.

Risks and Benefits

There are no anticipated risks to participation. Your input will help improve the understanding of the importance of health literacy and medication adherence.

Consent Statement

I have read and understood the information above. I voluntarily agree to participate in this study.

Participant's Name: (optional) _____

Signature: _____

Date: _____

Researcher's Signature: _____

Please read carefully before answering:

Section A – Demographics

➔ Who are you filling this survey for? (please tick one)

- a) Myself (I am between 55+ years old)
- b) My parent/grandparent (Aged 55+ years old)

1) Age group of respondent:

55 to 65 years 66 to 75 years 76 to 85 years

2) Education level:

Primary Matriculation Intermediate Undergrad

Please circle the answer that best represents your response.

1. How often do you have someone help you read hospital materials?

- 1. Always
- 2. Often
- 3. Sometimes
- 4. Occasionally
- 5. Never

2. How often do you have problems learning about your medical condition because of difficulty understanding written information?

- 1. Always
- 2. Often
- 3. Sometimes
- 4. Occasionally
- 5. Never

3. How often do you have a problem understanding what is told to you about your medical condition?

- 1. Always

2. Often
3. Sometimes
4. Occasionally
5. Never

4. How confident are you filling out medical forms by yourself?

1. Not at all
 2. A little bit
 3. Somewhat
 4. Quite a bit
 5. Extremely
-

The 8-item Morisky Medication Adherence Scale (MMAS-8)

Below is a list of statements. Please indicate the extent to which you agree or disagree with them by marking the number of the appropriate box. There are no right or wrong answers. Please give honest answers; otherwise the result would not be valid.

1. Do you sometimes forget to take your antihypertensive medication?

- (1) Yes
- (2) No

2. Over the past 2 weeks, were there any days when you did not take your _____ medication?

- (1) Yes
- (2) No

3. Have you ever cut back or stopped taking your _____ medication without telling your doctor because you felt worse when you took it?

- (1) Yes
- (2) No

4. When you travel or leave home, do you sometimes forget to bring your _____ medication?

(1) Yes

(2) No

5. Did you take your antihypertensive medicine yesterday?

(1) Yes

(2) No

6. When you feel like your blood pressure are under control, do you sometimes stop taking your _____ medication?

(1) Yes

(2) No

7. Do you ever feel hassled about sticking to your treatment plan?

(1) Yes

(2) No

8. How often do you have difficulty remembering to take all your _____ medication?

(1) Never/Rarely

(2) Once in a while

(3) Sometimes

(4) Usually

(5) All the time

Plagiarism Certificate

This is to certify that the research work entitled “Investigating The Role Of Health Literacy In Medication Adherence Among Older Adults With Chronic Disease In Peshawar” submitted by Salar Khan, in partial fulfillment of the requirements for the degree of Bachelor of Science in Public Health, is an original piece of work carried out by the student.

I further declare that this research has not been submitted previously to any other university or institution for the award of any degree or diploma. All sources of information used in this research have been properly acknowledged and cited. The similar index of this research work is within the acceptable limit as per university policies.





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