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Review

Does Health Literacy Have an Impact on Adherence to Diabetes Mellitus Treatment?

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Abstract: (1) Background: Health literacy is the intersection of general literacy, health, and healthcare, but it can also incorporate elements of other types of literacies to varying degrees. The notion of literacy surfaced from the fear that individuals would require more than general literacy skills to manage the complexities of health and health system issues. There is a substantial overlap between general literacy and health literacy. Diabetes patients frequently misinterpret medication instructions, resulting in non-adherence and poor health outcomes. (2) Aim: This study sought to review the literature on the impacts of health literacy on adherence and compliance to diabetes mellitus treatment. (3) Methods: A Narrative Literature Review method was used to identify, analyze, assess, and interpret the available information on health literacy regarding prescribed medication instructions. The following databases and search engines were used to locate the literature: electronic databases, search engines, and hand searches. Fifty-three (53) quantitative and qualitative studies and two books were reviewed. (4) Result: The review pointed out the following: the importance of health literacy, the implications of health illiteracy versus medication non-adherence, factors influencing health literacy versus medication adherence, and the interventions to improve medication non-adherence. (5) Conclusion: Relatively few studies have been conducted on how people living with diabetes should carry out their treatment. Therefore, more research on how people living with diabetes carry out their treatment daily is required. (6) Contributions: This study has identified that health literacy plays a role in adherence to treatment and contributes to improved health outcomes.

Keywords: health literacy; adherence; non-adherence; diabetes mellitus; treatment; prescribed medication

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1. Introduction

Health literacy is the intersection of general literacy, health, and healthcare, but it can also incorporate elements of the other types of literacy to various extents [1]. The belief that people require more than just general literacy skills to manage the complexity of health and health system issues gave rise to the concept of health literacy. There is a significant overlay between general literacy and health literacy. However, there are distinct health-specific demands in health literacy that differ from those in general literacy [1]. That is to say, having general literacy alone is insufficient if one wants to live a healthy lifestyle and be able to avoid, manage, and control diseases and illnesses. Numerous studies have shown that a lack of health literacy assessment results in healthcare professionals overestimating clients' health literacy skills. As a result, only half of the clients with inadequate health literacy are identified [2]. Additionally, it was suggested that an accurate and effective method of determining a client's health literacy should be in place to help nurses and other

members of the healthcare team identify individuals who struggle to fully understand and follow instructions and information about their health [2].

Therefore, health literacy is divided into three levels: basic/functional health literacy, communicative/ interactive health literacy, and critical health literacy [3].

2. Basic/Functional Health

Functional health literacy is described as having adequate basic skills in reading and writing to function properly in everyday life [3]. As a result, functional health literacy is essential for accessing services and information needed to support a person's health, such as reading medication-on-medication labels [3]. People living with diabetes need to follow their treatment regime, which includes lifestyle modification, following prescribed medication, and diet adherence. Treatment is defined as the management and care of a patient to fight a disease or disorder [4]. Prescribed medication is defined as the medication ordered by a licensed medical professional, typically a medical doctor [5]. On the other hand, non-adherence (which may be intentional—deciding not to follow treatment; or unintentional—unawareness of not following treatment) is the inability to follow medication or treatment proposals [6]. So, low health literacy in people living with diabetes mellitus can make it difficult to follow doctors' instructions and take prescribed medication properly; however, medical information can be fully grasped when projected little by little, using simple words and avoiding the provision of more information than is needed at one time [7]. Now, diabetes mellitus is the general name for a variety of metabolic conditions with chronic hyperglycemia as their primary symptom [8].

2.1. Communicative/Interactive Health Literacy

Interactive health literacy refers to more sophisticated cognitive, literacy, and social abilities that can be used to actively participate in daily activities [3]. These skills are used to retrieve information and meaning from various forms of communication and apply new information to changing situations. The interactive health literacy approach improves people's ability to act independently based on their knowledge [3]. Patients reported that communication with health and social care providers is frequently insufficient, according to a study conducted on barriers to medication adherence among rural women with hypertension [7]. As a result, it primarily causes patients to take their medications improperly [3]. Patients with poor health literacy would be less likely to understand and participate in programs for disease prevention and health promotion [4]. Compared to patients who have adequate health literacy, poor health literacy patients tend to require frequent hospitalizations [7].

Patients claimed to have confidence in their ability to take medications but confirmed a lack of understanding of the instructions for doing so [9]. Patients also mentioned several communication-related challenges to effective medication management and expressed a preference for medication instructions that were illustrated because they could help them with some of their problems [9].

2.2. Critical Health Literacy

Critical health literacy includes advanced cognitive skills that, when combined with social skills, can be used to seriously examine the information, as well as the use of that information to exert greater control over life events and situations [3]. As a result, health literacy extends beyond communication to the development of skills required to effect social change to promote health [3].

The following health literacy framework was developed based on these types of health literacy explanations (Table 1) [10].

Table 1. Health Literacy Framework.

	Types of Health Literacy	Nutbeam's (2000) Definitions	Categories of Analysis
1.	Functional/basic health literacy	An individual's aptitude for finding and understanding health information.	The ability to recognize and form patterns of physical activity in daily life.
2.	Interactive/ communicative health literacy	The capacity of an individual to apply health knowledge to various daily activities to achieve positive health outcomes.	The ability to put into practice one's understanding of how physical activity patterns are created, as well as the ability to plan and live a healthy lifestyle under the current conditions.
3.	Critical health literacy	Having the capacity to act to change circumstances that affect one's health and the health of others. This includes the capacity to address structural determinants of health and use the information to achieve maximum control.	The ability to understand how social determinants affect physical activity ranks, to relate critically to recommendations for physical activity, and to use these abilities to improve one's own and others' quality of life by changing the status quo.

According to the health literacy framework, an individual should have health literacy knowledge and understanding [10]. However, the individual must also act accordingly to demonstrate health literacy knowledge. Finally, the individual should enhance their daily life and the lives of others by adopting a healthy lifestyle as advised to improve their present situation [10]. Teachers at older primary and secondary schools can effectively integrate health literacy development into classroom-based curriculum teaching according to learners' stage of development [10].

2.3. Determining Health Literacy

Several instruments have been developed to assess health literacy, such as the Health Literacy Instrument for Adults (HELIA) [11]. Nonetheless, no agreement has been reached on which measure to use [11]. Health literacy measures are used in a variety of ways. Health professionals (professional nurses) can use these metrics to evaluate a patient's health literacy level at the start of a healthcare consultation [12]. As a result, researchers must demonstrate the necessary skills to improve health literacy, such as measuring health literacy before or after implementing a behavioral intervention using health literacy as an independent or control variable [4].

It has been revealed that nurses overestimate their patients' health literacy [2,13]. Nurses' overestimation of a patient's health literacy has been linked to a wide range of issues, including poor health outcomes, hospital readmission rates, and higher costs to the health system [2,13].

The potential for integrating health literacy screening into the admission database has been documented in a study on incorporating health literacy screening into the patient's health assessment [14]. This means that patient characteristics related to health literacy status should be considered for all adults seeking medical help in health institutions [14]. A low health literacy rate was discovered in 20% of the screened patients, which was applauded by the study's nurses as acceptable and helpful, and a large number of co-morbidities were present in these patients with low health literacy [14]. Despite being in a controllable age group and having several health conditions, the patients had a notably higher hospitalization rate within the 30 days of admission under study [14]. This means that irrespective of taking their medications on a monthly basis, patients with low health literacy are still at risk for poor disease management. Hence, this study investigated the impact of health literacy on treatment compliance and adherence in diabetes mellitus clients. The study's objectives were to outline the importance of health literacy and describe the factors that impact health literacy and treatment compliance in diabetes mellitus patients.

2.4. Methodology

A Narrative Literature Review (NLR) method was used to identify, analyze, assess, and interpret the available information related to health literacy on prescribed medication instructions [14]. A NLR was chosen because it enables the reviewer to retrieve literature from a variety of sources; the reviewer is not controlled by the literature, but rather controls the literature of interest and does not review all of the available literature. Only relevant studies were chosen, and no crucial report was omitted, ensuring that the body of literature is effectively represented in the final review. Furthermore, even research that contradicts the study was included to avoid selection bias [15].

2.4.1. Database Searches

The following databases and search engines were used to locate studies:

- Biomed, BMC, PLoS ONE, BMJ Open, Etho Med, Elsevier, Science Direct, and SABINET are electronic databases.
- Google Scholar, UL E-Libraries, Chrome, and Google Books are all search engines.
- Manual searches: reference lists compiled from retrieved literature.

2.4.2. Key Search Terms

Multiple combinations of the following keywords were used in the literature search: "Health literacy", "Medication instructions", "Diabetic medication comprehension", "Patient's medication interpretation", "Prescribed medication", Medication comprehension", "Non-compliance", "Medication Adherence", "Diabetes complications", "Contributory factors", "Poor medication adherence", "Effects of poor health literacy", "Poor health literacy", "Poor health literacy", and "Poor health literacy.

2.4.3. Parameters

Only publications that were written in English that were available at the time of the review of the literature were included in the study. This study excluded the publications that were more than ten years old at the time of review.

2.4.4. Findings

The following are the findings of the literature search:

Characteristics of the data source:

Fifty-three (53) studies, both quantitative and qualitative in nature, and two books were reviewed.

The following are the themes of the literature:

- "The significance of health literacy."
- "The Consequences of Health Literacy."
- "Contributing factors to health literacy and medication adherence."
- "Interventions to improve medication noncompliance."

2.5. The Significance of Health Literacy

Health literacy is vital to ensure access to care, self-care of chronic conditions, and maintenance of health and wellbeing; it is additionally essential to healthcare, mandating individuals play a greater role in decision making and management [16]. The Institute of Medicine (IOM) reports that 90 million Americans, likely half of the adult population in this country, lack the health literacy skills required to comprehend and act on health information and the health system [16]. Patients with diabetes mellitus misinterpret medication instructions on medication labels, which poses a medication safety and health literacy risk [17]. It was discovered that nearly half of patients receiving primary healthcare misread common dosage instructions on medication container labels [17].

Medication compliance is linked to health literacy. When compared to patients with sufficient health literacy, patients with low health literacy have been shown to have less

knowledge about how to take their medications as prescribed [14]. It has been confirmed that the role of health literacy is significant and that it can be an important indicator of medication compliance in patients with diabetes mellitus [18].

As a result, the study suggests that health literacy should be improved to promote medication adherence in diabetes mellitus patients [18]. Educational programs for monitoring and increasing public awareness of health literacy should therefore be a major focus. These programs should also include implementation, an evaluation that takes into account public feedback, and ongoing consultation with the medical staff [18].

It is indicated that reading medication labels correctly is an essential component of managing and controlling diabetes among Malaysians with the disease [19]. The study also found that reading the dosage instructions did not always prevent participants from demonstrating a practical understanding of how to take prescribed medications [19]. While literate individuals can read, because they lack health literacy, they are unable to understand medication instructions [19]. Since it is crucial for patients to fully understand their medications, the study recommended that steps be taken to improve medication label literacy among diabetes patients. Continual patient education, patient awareness campaigns, and other strategies to help patients understand medication labeling need to be implemented [19].

2.6. The Consequences of Health Literacy

Medication non-adherence is widespread throughout the world and is regarded as one of the most serious public health issues [20]. Half of all chronic disease medications, including diabetes medications, are estimated to be taken incorrectly. Non-adherence has been linked to poorer treatment outcomes, disease symptom progression, and complications. It has been discovered that patients do not always take their medications as prescribed [21]. This leads to suboptimal quality of the desired outcome in terms of prescribed medication therapy, as well as medication-related challenges [21]. Additionally, it has been noted that up to 50% of adults have a tendency to misinterpret dosage directions and warnings found on medication labels, leaflets, and prescriptions [21]. This might be the cause of the patient's failure to take their medication as directed [21]. The assumption made by healthcare professionals that patients can read medication instructions on labels, comprehend them, and respond appropriately is unsupported [21].

Non-adherence is also associated with increased healthcare usage and hospitalization [20]. This was also discovered in a study that revealed that the majority of diabetes mellitus patients had a knowledge gap regarding medication use during disease treatment [18]. This lack of knowledge has the potential to worsen the health of people with diabetes. As a result, there will be substantial growth in direct and indirect health costs [22]. Among diabetic patients, a critical concern is a lack of understanding of prescribed medications and medication labels [23]. The primary focus of the study was on basic medication knowledge and medication labels, which included information on dosages, duration, timing, indications, interactions, side effects, contraindications, and precautions [23]. Patients find it difficult to use the medications as desired when the instructions on the prescriptions and labels are unclear and unnecessarily complex, which results in non-adherence and could have negative health effects [23]. In a separate study, it was found that patients with poor functional health literacy had a higher likelihood of having poor glycemic control than other patients [24]. These results emphasize the need for clinical practice to address the issue of low health literacy [25]. This study indicates that good glycemic control in diabetes mellitus patients is compatible with adequate health literacy [25]. It has been reported that most diabetic patients are presently managed with the most effective available medications [24,25]. Nonetheless, the results from their study indicate a different outcome, wherein the anticipated blood sugar level could not be controlled and maintained effectively [24,25]. This outcome was due to poor adherence to the prescribed medication regimen and poor knowledge or practice of efficacious self-management strategies [24,25]. This reiterates the importance of instituting health literacy in diabetes mellitus patients.

Surprisingly, it has also been revealed that health professionals' health illiteracy regarding medication prescription interpretation poses a significant challenge to society [26]. In truth, those who lead the healthcare system's front lines lack literacy skills as well, so it is not just the patients who are impacted by poor health literacy [26]. All groups, including doctors, were observed to explain medication prescription instructions with a significant within-group disparity [26]. Additionally, there were differences in how the doctors, nurses, and healthcare consumers interpreted the prescription instructions across groups. No instruction was consistently followed, and a sizable number of patient and nurse interpretations led to potentially hazardous medication administration schedules [26]. The study also showed that some medical professionals, including nurses, were unaware of the likelihood of interpretation variability [26]. The study concluded that because health professionals may understand similar instructions differently, it is crucial to raise their level of awareness and to teach them about potential misinterpretation sources [26].

2.7. Contributing Factors to Health Literacy and Medication Adherence

According to research, several factors influence health literacy among different groups.

2.7.1. Inadequate Patient Education Coupled with Unclear Medication Instructions

Insufficient patient education regarding medication use, packaging, poor labeling instructions, and disease processes all contribute to non-adherence [27]. Patients who do not understand the importance of taking their medications as directed may not recognize them. Health professionals play a significant role in the dissemination of health information and are the first and most accurate sources of information in health-related matters [27]. Despite having limited time with patients during consultations, they fail to provide information as expected, and patients seek health information from sources with questionable credibility, such as the internet, television, and newspapers [27]. People make inaccurate judgments about their health as a result of these flawed sources [28]. Teaching patients how to find reliable information sources is important [28]. More specific and detailed health information materials should be available at all times for patients to refer to at home [28].

2.7.2. Gender

A study on gender differences in health literacy among Korean adults found that Korean women had a significantly higher level of health literacy than men in terms of understanding directions on medication bottles [29]. The study looked at gender differences in health literacy and the factors that influence it. According to the study, women are more accustomed to navigating the healthcare system when dealing with health issues, which may explain why there is a gender gap in health literacy [29].

Previous research has shown that most women report more health problems and use more medical services than men [29]. This might be a result of the conventional role of taking care of sick children and family members [29]. This traditional gender expectation provides women with more interactions with the healthcare system, giving them more opportunities to expand their knowledge base and reaching higher levels of health literacy than men as a result [29]. In the most recent study, women reported having chronic diseases with more depressive symptoms than men [29]. Why these women would experience depressive symptoms is a mystery to healthcare providers given that they are anticipated to be healthy and in control of their illnesses [29]. Nevertheless, when women are sick, they frequently receive inadequate care from their husbands or other family members, and they may take their medications improperly due to lack of proper care and support [29].

2.7.3. Socioeconomic Status

Previous research has found that people with a higher socioeconomic status or higher education levels have a better understanding of prescribed medications and medication labels, resulting in a lower occurrence of adverse medication events [23]. In spite of this, it was recorded that failure to understand and interpret medication prescriptions was

common across all educational levels [23]. Subsequently, patients who used multiple information sources were better informed about their medications than those who only used one source, such as medication labels alone, while others also used the internet, books, and leaflets [23].

2.7.4. Age

The age of the patients was one of the elements that contributed to non-adherence to prescribed medication [23]. Patient age has been noted as a contributing factor to the misperception and misinterpretation of prescription drugs and drug labels [23]. The study's findings provide additional evidence that the younger respondents understood the study's focus on various aspects of drug use, such as dosage, duration, and timing [23]. In contrast, research indicates that health literacy is a more reliable predictor of health outcomes than socioeconomic status, age, or ethnicity [1].

2.7.5. Polypharmacy

The complexity of medication therapy is one of the factors contributing to non-adherence related to poor health literacy. Patients with type 2 diabetes on complex regimens were three times more non-adherent than those on simple regimens [30]. According to the findings of this study, reducing diabetic medication therapy to one or two medications may make it easier for patients to adhere [30]. As a result, if poor health literacy is the only issue, diabetes mellitus patients have a history of non-adherence [30].

2.7.6. Poor Health Literacy Coupled with General Illiteracy

The following factors contribute to non-adherence in diabetes mellitus patients. Firstly, poor health literacy combined with low health numeracy is a significant contributor [30]. This applies to all people, regardless of whether they are literate or not. Secondly, inadequate or ambiguous medication instruction presents another risk, especially if it is not tailored to the patient, and not explained for each medication. Some patients misinterpret medication labels and information, which is common even when labeling requires only basic reading skills. For instance, instructions to take medication twice daily (which is unclear because "daily" only refers to once per day) or every 12 h imply that people should make additional decisions to understand the instructions [27]. Given the need for further clarification, the phrase "take medication as directed" is even more challenging to understand. Patients are more likely to comprehend more precise medication administration times, such as 08 A.M. and 06 P.M., but instituting periods can be beneficial for some people [27]. Cases in which patients misinterpret medication instructions, advice, or education and use multifaceted medication regimens on their own are possible [30].

It has been discovered that higher educational attainment combined with a family history of diabetes mellitus was significantly associated with a better understanding of health teaching and instructions [31]. According to the study, having adequate health literacy is not the only factor related to good glycemic control [31]. Instead, patients with a better understanding of health education and instructions can mask the effect of adequate health literacy in achieving good glycemic control [31]. As a result, health-literate patients may still struggle to understand medication instructions.

A lack of understanding of medication instructions can also have a negative impact on treatment efficacy and medication non-adherence, according to research. The issue is not only seen in patients who use medications but also dispensing health and medication manufacturers [21]. The majority of commonly used medication label instructions are unclear, and misunderstanding occurs even in highly educated patients [21]. Patients who do not take their medications as directed may do so for a variety of reasons, including a poor understanding of the directions for use or misinterpretations [21]. A misinterpretation of medication instructions results in subprime medication therapy because the patient may consume less medication than recommended, receive insufficient medication concentra-

tions, or face higher risks of overdosing and the consequent effects from ingesting high concentrations of the medication [21].

3. Interventions to Improve Medication Noncompliance

Medication non-adherence is costly and a serious health problem, and numerous health service interventions have offered solutions to improve medication adherence in specific circumstances and population groups, which were less successful due to poor implementation [20]. The study also demonstrated that educational interventions have been shown to increase adherence and produce better clinical results. However, the amount of work necessary to implement them successfully is the factor that makes it uncertain whether they should be taken seriously [20]. The advantages of educational interventions include the fact that they can be carried out by a variety of professionals, including teachers, health educators, nurses, and others, who are both accessible and affordable [32]. Educational interventions are simple to implement and require few resources, making them more effective than other methods [20]. A standard for written drug information that serves as a clear and organized structure for teaching patients was suggested [32]. The drug information on labels and inserts is therefore a major source of information for patients, but it is frequently inaccurate, insufficient, and challenging for patients to read and comprehend [32].

Many studies have focused on pharmacists as providers of information on medication use, but these pharmacists are expensive resources [20]. Since they can deliver comparable patient services at a lower cost, they can be supplemented by other skilled workers, such as certified health educators, social workers, licensed nurse practitioners, or other experts, such as schoolteachers and home-based carers [20]. It has been determined that a patient-centered strategy is the best way to address low health literacy and medication non-adherence. Numerous allegations about healthcare organizations' ability to properly disseminate health information among individuals with low health literacy were noted in a study on contextualizing health literacy in healthcare organizations [33]. It could be argued that healthcare organizations themselves lack a basic understanding of health literacy; their mission statements, strategic plans, and organizational initiatives do not take health literacy into account [33]. Patients are consequently left without the support they need to navigate the healthcare system from the organizations providing care [33]. The quality and appropriateness of care may be negatively impacted by this condition. Even though nurses and other healthcare professionals are independently involved in addressing the information needs of patients with low health literacy skills, their initiatives lose their effectiveness when the organization does not support them in increasing organizational health literacy [33].

In addition to other healthcare professionals, nurses are the first point of contact for patients at healthcare facilities. They can help patients understand, remember, and make use of medical information. Additionally, nurses can help patients navigate the convoluted healthcare system. However, for the medical staff to effectively implement their interventions, they must also be aware of the patients who are most at risk for poor health literacy [12]. Even if patients appear to accept health literacy screening, this does not mean that they are in a position to identify that they have a problem understanding health information or instructions, including medication instructions, on their own if no one asks them directly about such deficiencies [12].

People can only properly conserve, protect, and promote their health by accessing, comprehending, and acting on basic health information [28]. An assessment of health literacy, however, revealed a correlation between declining socioeconomic and educational levels and a decline in health literacy [28]. As a result, healthcare providers should take socioeconomic status and level of education into account when assessing the health literacy of patients [28]. Then, based on the findings, they should take appropriate action to raise the patients' level of literacy [28]. It was emphasized that, when assessing diabetic health literacy to combat non-adherence, nursing staff or other health professionals should

scrutinize the patient's awareness of the disease process, and its medical management, and explain diabetes-related information as demonstrated [31]. When a health professional explains the concept of a stable blood glucose level and the medication's half-life to a patient, they should also assess how the patient feels about the treatment's efficacy or inefficacy. This will help identify the causes of non-adherence [34].

The relationship between the number of doses per day, patient compliance in medicating themselves, and the frequency of readmissions was researched [35]. It was discovered that there is a strong correlation between patients' readmission frequency and polypharmacy, as well as noncompliance [35]. As a result, the study recommended that prescriptions be written in such a way that they minimize the risk of misunderstandings as well as the use of longer-acting formulations of fixed-dose combinations to reduce readmissions and achieve significant cost savings due to non-adherence [35]. One of the components strengthened by educational programs aiming to control diabetes mellitus is the lack of knowledge on the rational use of medications [22]. These diabetes education programs should emphasize the importance of using medications for appropriate control to reduce administrative errors and thus achieve the anticipated benefits [35]. Nevertheless, nursing schools and healthcare organizations take on the responsibility of educating their nurses about health literacy, particularly medication instructions [17]. If nurses are knowledgeable about this area of health, they will be in the best position to provide patients with the right information regarding medication instructions. This is because of claims that patients with diabetes mellitus and the general public only face difficulties related to a lack of health literacy [13]. Additionally, the medical staff may not be able to communicate clearly with patients due to low health literacy skills [13].

Negative health outcomes may result from a communication gap between a patient's comprehension ability and a healthcare provider [17]. To combat health illiteracy in diabetes mellitus patients, it is crucial that healthcare professionals be well-versed in health literacy and have strong communication skills.

A lack of health literacy has led to the adoption of policies aimed at enhancing both the proper use of medications and the ensuing health outcomes [36]. For instance, efforts to combine medications have complicated health literacy issues [36]. In the training of future health professionals, the measures available in medical schools, such as those available in pharmacy schools and schools for other health professions, must be improved [36]. The difficulties in reducing health illiteracy will be further aggravated as more people obtain insurance and succeed in receiving care [36]. To effectively address the public health issue of health illiteracy, measures concentrating on training, implementing changes to our curricula, continuing education efforts for current practitioners, and outreach activities with community groups, patients, and representatives are needed [36].

It was recommended that increased awareness of medication non-adherence be promoted through the incorporation of health literacy content in nursing and medical school programs [37,38]. To combat medication non-adherence, it may be helpful to keep providing in-service training to patients and healthcare professionals [38]. Manufacturers must be urged to improve the way they write instructions for consumers. The instructions should be formulated in clear language, as explicitly and thoroughly as possible [21]. Healthcare providers are responsible for clarifying the context of instructions verbally during patient consultations and providing additional written information to ensure proper medication use.

To effectively manage diabetes mellitus, patients should be provided with clear and precise information about how to use their medications [22]. This information, delivered by qualified health professionals, has the potential to motivate diabetes mellitus patients to engage in self-care and medication adherence [22]. Labels that instruct patients to take medications "Twice daily" or "Every 12 h" require patients to take extra mental actions to determine when exactly they should take their medication; for individuals who have limited literacy, this adds an unnecessary cognitive problem, resulting in poorer comprehension [17]. Interestingly, identifying specific times each day (e.g., 06 A.M, 07 P.M)

for administration is a more easily understood instruction format than stating times per day or hourly intervals [17]. The primary goal of each of these interventions is to increase patient understanding of how to read medication instructions [17]. As a result, it is believed that "current medication labeling problems that lead to medication errors must be reviewed, patient-directed information must be positively affected, and the healthcare provider-patient relationship must be reinforced" [39].

4. Summary and Recommendations of the Literature

There have been few studies on the impact of health literacy on treatment adherence. As a result, some studies have looked into the instructional information found in medication leaflets, packages, and labels and how they affect medication compliance. According to these studies, health illiteracy has negatively impacted treatment compliance. The authors made recommendations, but there appear to be no improvements to the instructional information that impact adherence. On the other hand, it is important to understand how people with diabetes mellitus take their medications and live with the disease. For this reason, the goal of this study was to scrutinize the available literature on how health literacy can impact treatment compliance in diabetes mellitus patients. Health literacy, therefore, positively impacts treatment compliance and can combat medication non-adherence. Consequently, more research on how patients carry out their prescribed medication instructions and their interpretation and treatment as a whole is required. The role of schools in imparting health literacy should also be established by researchers. It is noted that schools play a role in dispatching information that can impact the lives of people.

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References

1. Johnson, A. Health literacy, does it make a difference? *Aust. J. Adv. Nurs.* **2014**, *31*, 39–45.
2. Sand-Jecklin, K.; Coyle, S. Efficiently assessing patient health literacy: The BHLS instrument. *Clin. Nurs. Res.* **2014**, *23*, 581–600. [CrossRef] [PubMed]
3. Vidgen, H. *Food Literacy: Key Concepts for Health and Education*; Routledge: Abingdon-on-Thames, UK, 2016.
4. OSHA. *OSHA Recordkeeping: Medical Treatment versus First Aid*; Baldwin & Lyons, Inc.: Indianapolis, IN, USA, 2012; Available online: https://www.protectiveinsurance.com/Documents/the-quill/2012/02/medical-treatment-vs-first-aid.html (accessed on 3 August 2017).
5. Sfetchu, N. Health and Drugs: Disease, Prescription, and Medication; USA: Nicolae: Sfetchu. 2021. Available online: https://books.google.co.za/books?id=8jF-AwAAQBAJ&printsec=frontcover#v=onepage&q&f=false.html (accessed on 3 August 2017).
6. Usherwood, T. Encouraging adherence to long-term medication. *Aust. Prescr.* **2017**, *40*, 147. [CrossRef] [PubMed]
7. Petersmann, A.; Müller-Wieland, D.; Müller, U.A.; Landgraf, R.; Nauck, M.; Freckmann, G.; Heinemann, L.; Schleicher, E. Definition, classification and diagnosis of diabetes mellitus. *Exp. Clin. Endocrinol. Diabetes* **2019**, *127* (Suppl. 1), S1–S7. [CrossRef] [PubMed]
8. Shirindi, M.L.; Makhubele, J.C.; Fraeyman, J. Barriers to medication adherence among women living in rural areas suffering from hypertension: The case of dikgale-communities. *Stud. Ethno-Med.* **2016**, *10*, 76–84. [CrossRef]
9. Mohan, A.V.; Riley, M.B.; Boyington, D.R.; Kripalani, S. Illustrated medication instructions as a strategy to improve medication management among Latinos: A qualitative analysis. *J. Health Psychol.* **2013**, *18*, 187–197. [CrossRef]
10. Bruselius-Jensen, M.; Bonde, A.H.; Christensen, J.H. Promoting health literacy in the classroom. *Health Educ. J.* **2017**, *76*, 156–168. [CrossRef]
11. Tavousi, M.; Haeri-Mehrizi, A.; Rakhshani, F.; Rafiefar, S.; Soleymanian, A.; Sarbandi, F.; Ardestani, M.; Ghanbari, S.; Montazeri, A. Development and validation of a short and easy-to-use instrument for measuring health literacy: The Health Literacy Instrument for Adults (HELIA). *BMC Public Health* **2020**, *20*, 1–11. [CrossRef]
12. Snow, C.E.; Dibner, K.A. *Science Literacy: Concepts, Contexts and Consequences*; National Academy of Sciences: Washington, DC, USA, 2016.

13. Dickens, C.; Lambert, B.L.; Cromwell, T.; Piano, M.R. Nurse overestimation of patients' health literacy. *J. Health Commun.* **2013**, *18* (Suppl. 1), 62–69. [CrossRef]
14. Sand-Jecklin, K.; Daniels, C.S.; Lucke-Wold, N. Incorporating health literacy screening into patients' health assessment. *Clin. Nurs. Res.* **2017**, *26*, 176–190. [CrossRef]
15. Coughlan, M.; Cronin, P. *Doing a Literature Review in Nursing, Health and Social Care*, 2nd ed.; SAGE Publications: Ireland, Dublin, 2017.
16. Parker, R.M.; Jacobson, K.L. Health Literacy. Emory School of Medicine and Public Health. 2012. Available online: https://med.emory.edu/departments/medicine/divisions/geriatrics-gerontology/research/health-literacy.html (accessed on 3 August 2017).
17. Davis, T.C.; Federman, A.D.; Bass, P.F.; Jackson, R.H.; Middlebrooks, M.; Parker, R.M.; Wolf, M.S. Improving patient understanding of prescription drug label instructions. *J. Gen. Intern. Med.* **2009**, *24*, 57–62. [CrossRef]
18. Lee, Y.M.; Yu, H.Y.; You, M.A.; Son, Y.J. Impact of health literacy on medication adherence in older people with chronic diseases. *Collegian* **2017**, *24*, 11–18. [CrossRef]
19. Norhafizah, S.; Siti Zuraidah, M.; Riyanti, S.; Balkish, M.N.; Hamizatul Akmal, A.H.; Hatta, M. Medication labeling literacy among Malaysian with diabetes: A cross-sectional study. *J. Diabetes Res. Clin. Metab.* **2012**, *1*, 1–23.
20. Zullig, L.L.; Gellad, W.F.; Moaddeb, J.; Crowley, M.J.; Shrank, W.; Granger, B.B.; Granger, C.B.; Trygstad, T.; Liu, L.Z.; Bosworth, H.B. Improving diabetes medication adherence: Successful, scalable interventions. *Patient Prefer. Adherence* **2015**, *9*, 139. [CrossRef]
21. Koster, E.S.; Blom, L.; Winters, N.A.; Van Hulten, R.P.; Bouvy, M.L. Interpretation of drug label instructions: A study among four immigrants groups in the Netherlands. *Int. J. Clin. Pharm.* **2014**, *36*, 274–281. [CrossRef]
22. Faria, H.T.; Zanetti, M.L.; Santos, M.A.; Teixeira, C.R. Patients' knowledge regarding medication therapy to treat diabetes: A challenge for health care services. *ACTA Paul. De Enferm.* **2009**, *22*, 612–617. [CrossRef]
23. Patel, M.J.; Khan, M.S.; Ali, F.; Kazmi, Z.; Riaz, T.; Awan, S.; Sorathia, A.L. Patients' insight of interpreting prescriptions and drug labels-A cross-sectional study. *PLoS ONE* **2013**, *8*, e65019. [CrossRef]
24. Souza, J.G.; Apolinario, D.; Magaldi, R.M.; Busse, A.L.; Campora, F.; Jacob-Filho, W. Functional health literacy and glycaemic control in older adults with type 2 diabetes: A cross-sectional study. *BMJ Open* **2014**, *4*, e004180. [CrossRef]
25. Gelaw, B.K.; Mohammed, A.; Tegegne, G.T.; Defersha, A.D.; Fromsa, M.; Tadesse, E.; Gunasekaran, T.; Ahmed, M. Nonadherence and contributing factors among ambulatory patients with antidiabetic medications in Adama Referral Hospital. *J. Diabetes Res.* **2014**, *2014*, 617041. [CrossRef]
26. Harris, K.R.; Bradshaw, G.L.; Koch, K.; Iv, J.W. A prescription for misunderstanding: Opportunities for misinterpretation along the information flow from physician to patient. *J. Nurs. Educ. Pract.* **2014**, *4*, 1. [CrossRef]
27. Yap, A.F.; Thirumoorthy, T.; Kwan, Y.H. Medication adherence in the elderly. *J. Clin. Gerontol. Geriatr.* **2016**, *7*, 64–67. [CrossRef]
28. Çaylan, A.; Yayla, K.; Öztora, S.; Dağdeviren, H.N. Assessing health literacy, the factors affecting it and their relation to some health behaviors among adults. *Biomed. Res.* **2017**, *28*, 6803–6807.
29. Lee, H.Y.; Lee, J.; Kim, N.K. Gender differences in health literacy among Korean adults: Do women have a higher level of health literacy than men? *Am. J. Men's Health* **2015**, *9*, 370–379. [CrossRef] [PubMed]
30. Teklay, G.; Hussien, J.; Tesfaye, D. Non-adherence and associated factors among type 2 diabetic patients at Jimma University Specialized Hospital, Southwest Ethiopia. *J. Med. Sci.* **2013**, *13*, 578–584. [CrossRef]
31. Dunning, T. *Care of People with Diabetes: A Manual of Nursing Practice*; John Wiley & Sons: New York, NY, USA, 2013.
32. Chen, G.D.; Huang, C.N.; Yang, Y.S.; Lew-Ting, C.Y. Patient perception of understanding health education and instructions has moderating effect on glycemic control. *BMC Public Health* **2014**, *14*, 683. [CrossRef]
33. Shrank, W.H.; Avorn, J. Educating patients about their medications: The potential and limitations of written drug information. *Health Aff.* **2007**, *26*, 731–740. [CrossRef]
34. Annarumma, C.; Palumbo, R. Contextualizing health literacy to health care organizations: Exploratory insights. *J. Health Manag.* **2016**, *18*, 611–624. [CrossRef]
35. Swearingen, P.L. *All-in-ONE Nursing Care Planning Resource: Medical-Surgical, Pediatric, Maternity, and Psychiatric*, 4th ed.; Elsevier Health Sciences: Amsterdam, The Netherlands, 2016.
36. Toh, M.R.; Teo, V.; Kwan, Y.H.; Raaj, S.; Tan, S.Y.; Tan, J.Z. Association between the number of doses per day, number of medications and patient's non-compliance, and frequency of readmissions in a multi-ethnic Asian population. *Prev. Med. Rep.* **2014**, *1*, 43–47. [CrossRef]
37. Fincham, J.E. The public health importance of improving health literacy. *Am. J. Pharm. Educ.* **2013**, *77*, 41. [CrossRef]
38. Egbert, N.; Nanna, K.M. Health literacy: Challenges and strategies. *Online J. Issues Nurs.* **2009**, *14*, E1. [CrossRef]
39. Wolf, M.S. Health Literacy and Medication Safety: Can we confuse patients less? ACP Foundation: Promoting Health Literacy. USA: Northwestern University. Available online: https://Www.Fda.Goo/Downloads/Drugs/Drugssafety/Ucm173471.pdf (accessed on 1 May 2017).