

Health Literacy Sessions Led by Nurses: Its Effect on Patients' Health Literacy, Self-Care Practices, and Distress among Patients with Type II Diabetes Mellitus

**Omima Said M.H. Shehata¹, Gehan Elmadbouh²,
Rahma Abdelgawad Elkalshy³**

^{1,3}Assistant Professor Medical Surgical Nursing, ²lecturer Medical Surgical Nursing,
^{1,2,3}Faculty of Nursing, Menoufia University.

Abstract: Background: Appropriate interpretation of health information by the patients with type II diabetes mellitus is crucial for the improvement of their management. **Purpose:** To examine the effect of nursing-led health literacy sessions on patients' health literacy, self-care practices, and distress among those with type II diabetes mellitus. **Setting:** The study was conducted at the Menoufia University Hospital's Outpatient Clinic for Diabetes Mellitus and Endocrines in Shebin El-Kom, Menoufia Governorate, Egypt. **Instruments:** Five instruments were used, bio-socio-demographic structured interviewing questionnaire, diabetes knowledge test, diabetes specific health literacy scale, summary of diabetic self-care practices questionnaire as well as diabetic distress scale. **Results:** Showed statistically significant improvements in the mean scores of patients' knowledge, health literacy, self-care behaviors and diabetic distress in favor of the posttest after health literacy sessions where the means \pm SD and p values in the posttest were (17.07 \pm 4.4, P=0.000; 57.19 \pm 13.6, P=0.000; 48.14 \pm 12.09, P= 0.000, and 1.75 \pm 0.63, P=0.000, respectively). Moreover, the results of Pearson's correlation coefficient showed a positive correlation between health literacy and patients' knowledge (P=0.000, r=0.62), as well as health literacy and self-care practices (P=0.001, r=0.32). There was also a positive correlation between health literacy and age (p=0.001, r= .82). Additionally, presence of negative correlation between health literacy and distress (P=0.000, r=0.65). **Conclusion:** Diabetes self-care education sessions led by nurses can enhance knowledge and practice among diabetic outpatients and reduce diabetic distress. According to the study, hospitals should routinely offer patients health literacy education and training on managing their disease. **Recommendations:** Since self-care practices and distress levels in diabetic patients can be affected by health literacy, nurses are advised to create and implement straightforward educational interventions to improve health literacy, which will in turn encourage self-care practices and reduce distress.

Key words: *diabetes mellitus nurses, distress, health literacy, self-care*

Introduction

Diabetes mellitus (DM), a long-term, progressive metabolic condition, is defined by hyperglycemia, which is primarily brought on by an absolute (Type 1 DM) or relative (Type II DM) lack of the hormone insulin. It is a condition that interferes with the body's capacity to adequately make or use insulin to regulate blood sugar levels. After a period of time having too much blood glucose might harm several body organs (Centers for Disease Control and Prevention, 2022). Diabetes Mellitus affects 537 million people globally and will be raised to 629 million by 2045. Egypt is one of 21 nations in the Middle East and North Africa region as more than 73 million people in this region have DM and will be reached to 135.7 million by 2045. Egypt considers on of the largest population with DM in the world, as predominance of DM is expanding rapidly in the population where it has been ranked as the ninth most populous nation for those suffering from type II DM as it represents 18.4 % of all adults aged between 20-79 years (International Diabetes Federation, 2021; Sirdah & Reading, (2020)

Type II DM can cause a number of complications, including peripheral artery disorders, heart disease, diabetic retinopathy, diabetic nephropathy, and diabetic foot ulcers. These complications are preventable by appropriate self-care (Wu et al., 2022; Da Rocha et al., 2020).

A multidisciplinary approach to care and a particular set of self-care practices are required for effective care. Patients must make several daily decisions regarding their way of life,

their medications, and therapies that must work. They also engage in self-care practices to control their disease. In actuality, persons with type II DM perform roughly 95% of diabetes self-care practices. Therefore, it is crucial that diabetic patients are aware of these practices, assured that they can make the needed adjustment, and ready to actually adopt the practices. An essential component of diabetes care is diabetes education, which emphasizes encouraging optimal self-care practices (Haas et al., 2014; Krichbaum et al., 2003).

Diabetes education should effectively inform patients about the actions required for glucose control and a lifestyle that lowers the risk of developing complications, inspire patients to practice effective self-care and to keep learning more about how to live well with diabetes, and both encourage and support patients who are having difficulty managing their condition. Education about diabetes self-care is essential for managing Type II DM, lowering complications and enhancing long-term health outcomes (American Diabetes Association, 2021).

A person's ability to successfully obtain and utilize health-related information to enhance and maintain good health is known as health literacy (HL). While literacy can help people understand and convey health-related information and problems, health literacy is when these skills are used in a health-related context. Even if a person has a good education, their health literacy may be poor. A way to empower patients and help reduce

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inequality in the society to become healthier, and safer, it occurs by raising HL rates (Hepburn, 2021). Also according to Ziapour et al. (2020) HL refers to a person's capacity to learn the essential skills, comprehend the pertinent medical information, and take use of the medical services required to make informed health decisions. Treatment and care for chronic disorders like diabetes can be hampered by low HL levels.

More than 70% of the healthcare workforce is nurses, who spend a lot of time providing patient care, have more access to patients and their families, and can assess the caliber of education. As a result, nurses provide everyday training opportunities for patients that make patient education is an effective nursing strategy (Molina & Gallo, 2020). According to Aalaa et al. (2012) nurses play a crucial part in the care of DM and a significant role in diabetes education since nurses make up the largest group of medical professionals that have extensive interaction with patients. In order to address patients' requirements, nurses mix science and art. In the provision of direct patient care and health services, according to Sofaer and Schumann (2013) nurses have crucial role in order to effectively care for patients with low HL, nurses should be able to identify the patient's HL level and be ready to deal with any difficulties that may arise.

Significance of the study:

Diabetic patients have numerous obstacles while attempting to manage their chronic condition on their own. When a patient receives the diagnosis of diabetes, they can be feeling of

failure, distress, anxiety, depression, anger, frustration and possibly denial that can lead to patient noncompliance. Healthcare staff fail to effectively communicate with their all patients which leads to lack of knowledge and a disassociation with self-care (Jalilian et al., 2013).

The promotion of evidence-based treatment for diabetes patients is under the purview of nurses, with education being viewed as a crucial component of high-quality nursing care since nurses can adopt evidence-based and evidence-focused chronic illness management strategies to enhance patient care outcomes. Patients with inadequate health literacy frequently do not perform self-care practices that are recommended, which results in poor outcomes and hospital readmissions (Massimi et al., 2017; Wallace et al., 2016).

Despite widespread agreement regarding the advantages of self-care practices, prior research has shown that most patients with type 2 diabetes did not perform self-care practices correctly, and only 15.1% had good adherence to self-care practices (Yekta et al., 2011).

The last annual statistical report of Menoufia University Hospital for rate flow of diabetic patients in the year of 2022 was 965 patients (Statistical record of Menoufia University Hospital, 2022). Despite the increasing incidence of DM, assessing nursing led health literacy education and training on self-care practices for diabetic patients had limited. Moreover there is limited research, has been done about it in Menoufia University. So the researchers decided and hoped that the

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present study provides a pathway for evidence based practice to examine the effect of nursing-led health literacy sessions on patients' knowledge, health literacy, self-care practices, and distress among patients with type II diabetes mellitus.

Purpose:

To examine the effect of nursing-led health literacy sessions on patients' knowledge, health literacy, self-care practices, and distress among those with type II diabetes mellitus

Research hypothesis

The current study is hypothesized the following:

- 1) Participating patients are expected to exhibit higher level of knowledge after receiving nurse led health literacy sessions on posttest than pretest
- 2) Participating patients are expected to have higher level of health literacy after receiving nurse led health literacy sessions on posttest than pretest
- 3) Participating patients are expected to report higher level of self- care practices after receiving nurse led health literacy sessions on posttest than pretest
- 4) Diabetic patients are expected to report lower level of distress after receiving nurse led health literacy sessions on posttest than pretest

Research design:

The current study used a quasi-experimental design (pre-posttest design).

Study setting:

The current study was conducted in the Outpatient Clinic of DM and

endocrines (which exist in the highest first floor of Menoufia University Hospital), in Shebin El –Kom, Menoufia Governorate, Egypt.

Sampling:

Participating patients in the study were chosen using a purposive sampling method. 100 patients included in the study according to the following inclusion criteria were age ranged from 18 to 60 years, have confirmed diagnosis of DM for at least 6 months, can to read and write, able to communicate by using smart phone as well as able to access to telephone Technology, have no cognitive problems or mental disease because they must be sufficient cognitive maturity in order to be able to use phones. Patients who attended to previous diabetes health education sessions were excluded from the study.

Calculation of the sample size:

It was determined based on the review of past literature by El Banna et al., (2021).

As the sample was type II DM patients with certain inclusion criteria, the sample size was determined depend on the following equation:

$$n = n_0 / [1 + \{(n_0 - 1) / N\}]$$

Where (n) is the sample size according to included criteria and N is the population size = 965.

$$n_0 = Z^2 p q / e^2$$

Z² = is the desired confidence level which is 95% (1.96)

e = is 0.05 (5%) the desired level of precision,

p = is the estimated percentage of an attribute that is present in the population = 0.07, and q is 1-p.

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$$n = Z^2 p q / e^2 [1 + \{(Z^2 p q / e^2 - 1) / N\}] = (1.69)^2 \times 0.07 \times (1 - 0.07) / (0.05)^2 [1 + \{(1.69)^2 \times 0.07 \times (1 - 0.07) / (0.05)^2 - 1\} / 965] = 90.724$$

To avoid drop out of sample, the sample size was increased so total sample 100 patients.

Instruments:

Five instruments were used in the current study as the follows:

Instrument one: Bio-socio-demographic structured interviewing questionnaire:

It was developed by the researchers to assess characteristics of patients. It contains two parts:

Part 1: Socio-demographic characteristics: It included data about gender, residence, age, educational level, occupation, marital status and income.

Part 2: Medical data: It contained patient's medical background. It included medical data such as duration of the disease, current medication, family history and presence of complication for DM. Cronbach's alpha test-retest was used to assess the tool' reliability, across a two-week interval was 0.89, showing good reliability.

Instruments two: The Diabetes Knowledge Test (DKT):

It was developed by the Michigan Diabetes Research and Training Centre (1990) to assess patient diabetes knowledge. DKT had a twenty-three-items test, which divided into two:

Part 1: General test: it had fourteen items to assess diabetes-related knowledge of nutritional management,

glucose monitoring, physical activity, and complications.

Part 2: Insulin test: it had the subsequent items nine items. The DKT made up of questions with multiple-choice that each had only one right answer. The overall test score range from 0 to 23, with the general test ranging from 0 to 14, also, the insulin test ranging from 0 to 9. The highest scores reflect greater patients' diabetes knowledge. Based on the categorization that performed by Al-Qazaz et al., (2010), the total score divided into 1 of 3 categories: low (zero -12 mark); acceptable (13–17 mark); and good (19–23 mark).

The validity and reliability of the test was supported by Asim et al. (2022) who stated that the Arabic translation of DKT is an acceptable tool which can be used to measure the effectiveness of diabetes education program and would help to identify patient's education needs. They mentioned that the tool received internal consistency scores with coefficient alpha = 0.60 for general test as well as 0.78 for the insulin test.

Instrument 3: Diabetes specific health literacy scale:

This scale developed by Ishikawa et al., (2008) and adapted by Tefera et al., (2020). It consisted of 15 items that describe the ability of the patient to read and understanding own health information; ability to communicate and interact with healthcare professionals as well as ability for critical thinking and decision making. Each item has likert scale with 5 point: 1= strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, and 5 = strongly

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agree. The overall score was calculated (between 15 to 75) with the highest scores reflect the highest levels of HL. Scores like $\geq 75\%$ indicate high diabetic HL; 60–74% indicate moderate diabetic HL; and $\leq 59\%$ indicate low diabetic HL (Liu et al., 2018; Kassahun, et al., 2016). The scale's Cronbach's alpha was reported to be 0.78.

Instrument four: Summary of Diabetic Self-Care Practices Questionnaire.

It was developed by Toobert et al., (2000) and modified by Mosnier et al., (2009). It consisted of 12 items measuring self-care practices indicating the patient's adherence to a diabetes regimen for the past seven days. In five domains including dieting (3 items), physical activity (2 items), blood glucose level checking (1 items), foot care (4 items) and medication adherence (2 items); mean scores for each practice ranged from zero to 7 to match with week days, the total scores ranged from zero to 77, the highest scores indicating the highest frequency. The internal consistency Cronbach's alpha coefficient was 0.71 and the test-retest reliability was 0.78 (Syed et al., 2022).

Instrument five: Diabetic Distress Scale:

It was developed by Polonsky et al., (2005). The scale used to measure the distress associated with diabetes including four subscales: interpersonal distress (3 items), physician-related distress (4 items), regimen-related distress (5 items), and emotional

burden (5 items). A six-point Likert scale was used to evaluate each response, with 1 denoting no distress, 2 a minor distress, 3 a moderate distress, 4 a somewhat serious distress, 5 a serious distress, and 6 a very serious distress. The mean of all responses is calculated to produce a final score. Cutoff values were chosen as little/no distress < 2 , moderate distress 2-2.9, and high distress ≥ 3 (Fisher et al., 2012). The diabetic distress scale has good reliability overall ($\alpha = 0.93$).

Validity and reliability of the instruments:

A group of five specialists, two professors of medicine from the Menoufia University Faculty of Medicine and three from the Adult Health Nursing Department of the Menoufia University Faculty of Nursing, established the tools' content and face validity. Each expert was tasked with reviewing the educational booklet and instruments for topic coverage, clarity, phrasing, length, format, and overall appearance. The value of instruments reliability was mentioned before in each one.

Ethical considerations:

The essential approval to perform the study was obtained from research and ethical committee at the Faculty of Nursing, Menoufia University (No: 802). The purpose of the study was communicated to each patient to earn their confidence and trust. Each patient who accepted to participate in the study gave their oral and written consent after it was confirmed that the information collected would be handled in confidence by coding all

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data and placing all papers in a locked cabinet. The study procedures also don't have any negative consequences on the participating patient, either physically or emotionally. Patients were advised that they might leave the study at any time.

Pilot study:

Ten patients (10% of the overall sample size) participated in the pilot study. The purpose of the pilot study was to evaluate the instruments used for data collection in terms of their relevance, clarity as well as the time required by patients to complete the study's instruments and identify any potential challenges or issues that might arise.

Procedure:

In order to secure authorization for data collection, an official letter was submitted from the Dean of Faculty of Nursing; also a letter with the study's title was submitted to the director of Menoufia University Hospitals.

The study was conducted between March 2022 and February 2023, and the researchers were generally available two days per week during that time (Monday and Thursday because the diabetic and endocrine outpatients' clinics work on these days) from 9.30 am to 1.30 pm. Data collection was carried out through four following phases:

In the assessment phase:

Individual interviews were conducted using data collecting form. Interviews were conducted to assess patients diabetic knowledge, identify their level of health literacy and distress as well as patients self- reported practices such

as diet., physical activity , blood glucose level checking , foot care and medication adherence. The data collected served as a baseline for a pretest and helped the researchers create an educational diabetes self-care practices and educational booklet.

During the planning phase:

Patients' needs were determined during the assessment phase, the researchers created instructional diabetic self-care practices. To aid patients in remembering, the researchers developed an illustrated booklet in Arabic according to guideline of Canadian Diabetes Association (2022), Scottish Intercollegiate Guidelines Network (2018), National Diabetes services scheme (2020), Diabetes Ireland Care Centre (2022) and Johns Hopkins University (2022). Experts in nursing and medicine were asked to evaluate the booklet.

At implementation phase:

The researchers divided patients into groups by using online facilities and technologies of smart phone Apps forming WhatsApp groups or Telegram groups according availability for the patients of their smart phone. Every group included 14-17 patients, each patient received 8 sessions (2 sessions per week for one month) which considered telephone support (Tele-nursing) sessions. Every session lasted between 30 and 45 minutes. The first four sessions included the theoretical parts and covered topics such as the definition of diabetes mellitus, its causes, types, clinical manifestations, laboratory investigations, treatments, dietary

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guidelines, physical activity regimens, and complications. While the remaining 4 sessions were for the practical part, which included a diet and exercise plan, medication administration, insulin self-injection, blood and urine glucose testing, hygiene care, foot and wound care, and periodic follow-up. The researchers encouraged and reinforced learning throughout sessions by using language that was easy for the patients. In the first day of assessment of the patient a copy of the booklet was provided to each patient to serve as a guide in the future. When the patients came to the outpatient clinics for follow up and take the prescribed medications from the hospital one month ago from the first appointment, the researchers make face to face return demonstration for the practical part of self-care practices according to the patients' needs. As well as, there were continuous communications between the researchers and their patients to answer their questions and as well as, follow up from the researchers to their patients to apply what is learned from the educational diabetic self-care practices sessions (Telephone follow ups).

During evaluative phase:

the same data collecting instrument were used to examine every patient in the study twice: once before the educational sessions (Pretest), and again two months later (Posttest). To achieve the study's objective, the pretest and post- test intervention data of the participating patients were compared.

Statistical analysis:

Data entry was done as well as statistical analysis was conducted by using Statistical Packages for Social Science (SPSS), version 22.0. Data were illustrated using descriptive statistics in the form of means and standard deviations (Mean±SD) for quantitative variables. In addition to, frequencies and percentages for qualitative variables. Qualitative variables were compared using Chi-square test (X²). But quantitative variables were compared using paired t-test. Personal correlation coefficient test was used to find the correlation between variables. Statistical significance was considered at p-value < 0.05.

Results

The current study's findings were illustrated in six main sections: 1) bio-socio-demographic characteristic data of the study sample, 2) diabetic knowledge scores and its categories, 3) health literacy scores and its levels, 4) self-care practices scores, 5) diabetic distress score and its categories as well as 6) correlations among selected variables.

Table 1 illustrates distribution of participants in the study group according to socio-demographic characteristics. It is noted that more than one third of the study group (35 %) had forty years and less than fifty with a mean age 41.6±10.0. Regarding gender, more half of the participants (56%) were females. Half of them (50%) were married.

Table 2 illustrates the distribution of participants in the study group according medical data. This table

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shows that greater than one third of the study group (40%) had diabetes between 5 to less than 10 years. In relation to the current treatment of diabetes, nearly one third of the study group (33%) take oral hypoglycemic drugs as well as one third of the study group (33%) take oral hypoglycemic drugs and insulin as a treatment. Also half of them (50 %) complain from the presence of complications, the majority of these complications were neuropathy (15%).

Table 3 demonstrates mean knowledge scores of participants in the study group pre and post HL sessions. It is noted that there was an improvement in mean and standard deviation post sessions than pre sessions in the two parts general knowledge about diabetes and insulin knowledge are 10.03 ± 2.6 , 3.7 ± 3.3 ; and 7.03 ± 1.9 , 2.7 ± 2.5 respectively. Moreover, there were highly significant statistically differences between participants in the study group pre and post HL sessions.

Figure 1 shows level of knowledge of participants in the study group pre and post HL sessions. It is observed that the majority of the participants in the study group had low diabetic knowledge pre sessions (84%). Half of the participants (50%) had good knowledge & 40% had acceptable knowledge post sessions.

Table 4 demonstrates health literacy of participants in the study group pre and post HL sessions. It was noted that in pre sessions 81% of participants had low HL; 12% of the participants had moderate HL and 7% had high HL. Although, in post sessions 10% of the participants had low HL; 40% of the subjects had moderate HL and 50%

had high HL. Therefore, there were highly statistical significant differences between participants pre and post HL sessions (where p value = 0.000 respectively).

Table 5 shows mean of self-care practices score for the study group pre and post HL sessions. It is noted that there were improvement in mean and standard deviation post sessions than pre sessions, concerning diet (12.17 ± 6.05 , 6.45 ± 3.9 respectively), physical activity (9.24 ± 3.75 , 3.57 ± 2.9 respectively), blood glucose monitoring (4.05 ± 2.07 , 1.9 ± 1.5 respectively), foot care (18.6 ± 6.5 , 6.16 ± 4.9 respectively), medication adherence (4.05 ± 2.07 , 2.09 ± 1.6 respectively). Therefore, there were highly statistically significant differences between pre and post HL sessions (where p value = 0.000).

Table 6 represents mean and standard deviation of distress among participants in the study group pre and post HL sessions. It is noted that there were decreased in mean and standard deviation of distress post HL sessions than pre, concerning emotional burden (1.77 ± 0.77 , 4.05 ± 1.09 respectively), physician distress (1.72 ± 0.57 , 4.14 ± 1.30 respectively), regimen distress (1.70 ± 0.72 , 4.07 ± 1.13 respectively), and interpersonal distress (1.62 ± 0.73 , 3.78 ± 1.15 respectively). In addition to, there were highly statistically significant differences between pre and post HL sessions concerning subjects' distress of previous mentioned items (where p-value = 0.000).

Figure 2 represents description of distress levels for the study group pre and post HL sessions. It was noted that

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in pre HL sessions 5% of the subjects had no| little distress; 20% of the subjects had moderate distress and 75% had high distress. Although, in post HL sessions 79% of the subjects had no or little distress; 20% of the subjects had moderate distress and 10% had high distress.

Table 7 shows the correlations among health literacy and selected variables

(age, knowledge, self- care and distress). It is observed that there were positive correlations with highly statistical significance differences between health literacy and age; also patients' knowledge in addition to self-care. But there were negative correlations with highly statistical significance differences between health literacy and distress.

Table (1): Distribution participants in the study group according to socio-demographic characteristics

Socio-demographic characteristics	Study group (n=100)	
	No.	%
Age (years):		
• Mean±SD	41.6±10.0	
• Range	20.0 – 60.0	
Age categories (years):		
• 18 - < 30	8	8
• 30 – < 40	32	32
• 40 – < 50	35	35
• 50 -60	25	25
Gender:		
• Male	44	44
• Female	56	56
Marital status:		
• Single	20	20
• Married	50	50
• Widowed	13	13
• Divorced	17	17
Level of education:		
• Read and write	30	30
• Primary	40	40
• Secondary	18	18
• University	12	12
Occupation:		
• Work	68	68
• Not work	32	32
Income:		
• Enough	50	50
• Not enough	35	35
• Enough and increasing	15	15

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Table (2): Distribution of participants in the study group according to their medical data

Medical data	Study group (n=100)	
	No.	%
Duration of DM (years) <ul style="list-style-type: none"> • < 5 yrs • 5- < 10 yrs • ≥ 10 yrs 	29 40 31	29 40 31
Current treatment of DM: <ul style="list-style-type: none"> • Diet and exercises • Oral hypoglycemic drugs • Oral hypoglycemic drugs and insulin • Insulin 	10 33 33 24	10 33 33 24
Presence of complications of DM: <ul style="list-style-type: none"> • Yes • No Types of complications: <ul style="list-style-type: none"> • Diabetic foot • Neuropathy • Nephropathy • Retinopathy • Vascular disease 	50 50 5 15 12 10 8	50 50 5 15 12 10 8
Comorbidities: <ul style="list-style-type: none"> • Yes • No Types of comorbidities: <ul style="list-style-type: none"> • Hypertension • Renal disease • Liver disease • Cardiac disease • Others 	51 49 16 13 8 10 4	51 49 16 13 8 10 4
Family history: <ul style="list-style-type: none"> • Yes • No 	25 75	25 75

Table (3): Mean scores of knowledge of participants in the study group pre and post HL sessions

Subscales	Study group (n=100)		Paired t-test	P- value
	Pre HL sessions	Post HL sessions		
	Mean ±SD	Mean ±SD		
General knowledge to DM	3.7±3.3	10.03±2.6	17.7	0.000**
Insulin knowledge	2.7±2.5	7.03±1.9	16.1	0.000**
Total score	6.4±5.3	17.07±4.4	18.3	0.000**

(*) Statistically significant at P < 0.05

(**) Highly statistically significant at P < 0.001

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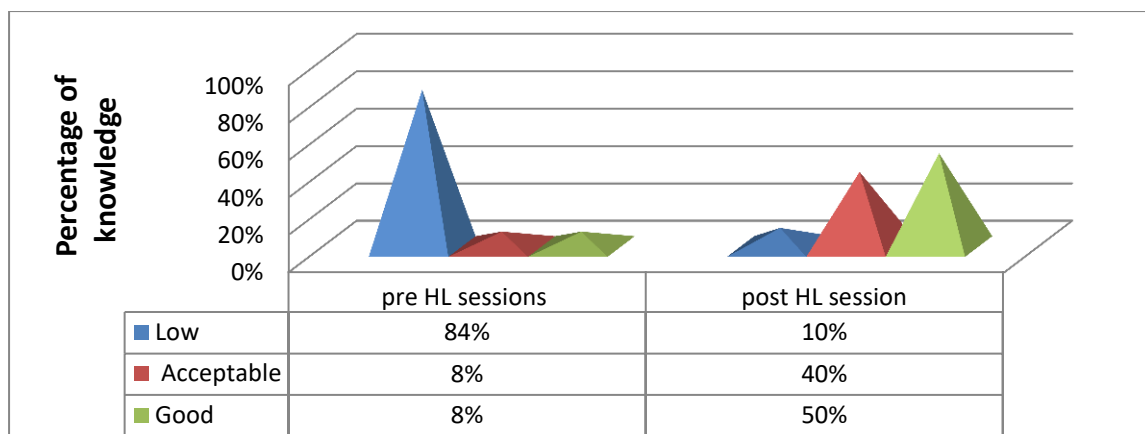


Figure (1): Level of knowledge of participants in the study group pre and post HL sessions

Table (4): Health literacy of participants in the study group pre and post HL sessions

Level of health literacy	Study group (n=100)				χ^2	P- value
	Pre HL sessions		Post HL sessions			
	No.	%	No.	%		
Low	81	81	10	10	11.55	0.02*
Moderate	12	12	40	40		
High	7	7	50	50		
Total score of health literacy Mean \pm SD	30.8 \pm 14.03		57.19 \pm 13.6		Paired t-test 21.35	0.000 **

(*) Statistically significant at $P < 0.05$

(**) Highly statistically significant at $P < 0.001$

Table (5): Means of self-care practices scores for the study group pre and post HL sessions

Subscales	Study group (n=100)		Paired t-test	P- value
	Pre HL sessions	Post HL sessions		
	Mean \pm SD	Mean \pm SD		
Diet	6.45 \pm 3.9	12.17 \pm 6.05	6.8	0.000 **
Physical activity	3.57 \pm 2.9	9.24 \pm 3.75	11.1	0.000 **
Blood glucose monitoring	1.9 \pm 1.5	4.05 \pm 2.07	6.9	0.000 **
Foot care	6.16 \pm 4.9	18.6 \pm 6.5	14.6	0.000 **
Medication adherence	2.09 \pm 1.6	4.05 \pm 2.07	6.3	0.000 **
Total score	20.3 \pm 12.3	48.14 \pm 12.09	13.6	0.000 **

(*) Statistically significant at $P < 0.05$

(**) Highly statistically significant at $P < 0.001$

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Table (6): Mean and standard deviation of distress among participants in the study group pre and post HL sessions

Subscales	Study group (n=100)		Paired t-test	P- value
	Pre HL sessions	Post HL sessions		
	Mean±SD	Mean±SD		
Emotional burden	4.05±1.09	1.77±0.77	13.32	0.000 **
Physician distress	4.14±1.30	1.72±0.57	14.80	0.000 **
Regimen distress	4.07±1.13	1.70±0.72	14.00	0.000 **
Interpersonal distress	3.78±1.15	1.62±0.73	12.33	0.000 **
Total score	4.01±1.0	1.75±0.63	14.67	0.000 **

(*) Statistically significant at P < 0.05

(**) Highly statistically significant at P < 0.001

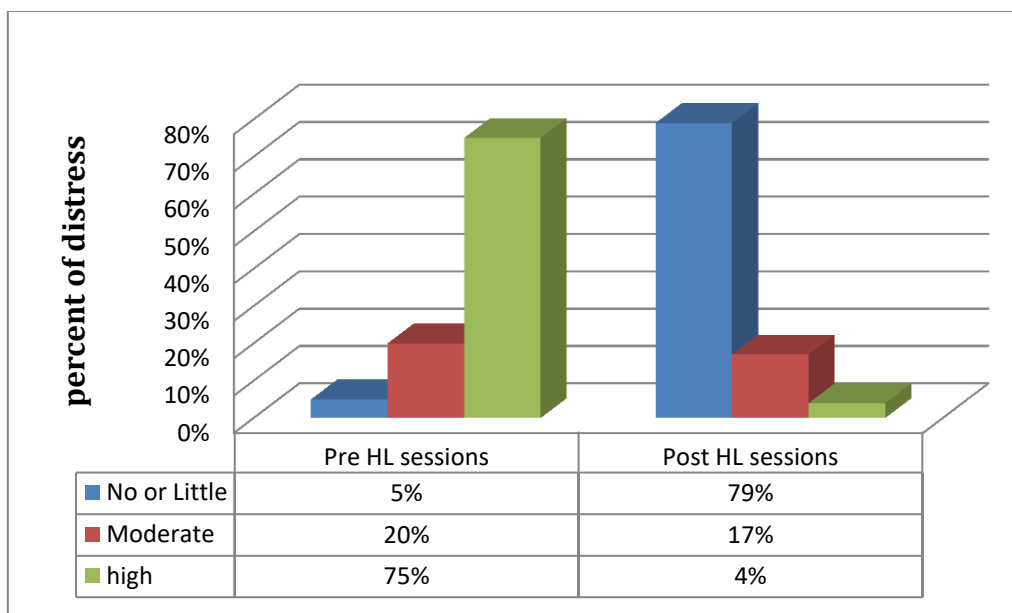


Figure (2): Description of distress levels for the study group pre and post HL sessions

Table (7): Correlations among health literacy and selected variables (age, knowledge, self-care and distress)

Health literacy		
Age	Pearson Correlation	.823
	Sig. (2-tailed)	.000**
Knowledge	Pearson Correlation	.627
	Sig. (2-tailed)	.000**
Self-care	Pearson Correlation	.323
	Sig. (2-tailed)	.001**
Distress	Pearson Correlation	-.657-
	Sig. (2-tailed)	.000**

(*) Statistically significant at P < 0.05

(**) Highly statistically significant at P < 0.001

Discussion

Education, better health literacy, and knowledge could aid diabetic patients in managing their diseases, lowering their perception of distress, and using productive coping mechanisms. The World Health Organization views education as the cornerstone of the management of diabetes and has highlighted the promotion of self-care, alteration of attitudes, and greater awareness are considered the three main objectives of diabetes education (Beck et al., 2017).

In order to treat and self-manage their condition, patients with diabetes must have the necessary skills and abilities to seek out, comprehend, analyze, communicate, and enumerate diabetes-related information in both the healthcare setting and daily life. This is known as diabetic related health literacy. Patients with inadequate health literacy have some difficulty understanding health-related information and have issues communicating their situation to healthcare professionals, which leads to poor self-care (Lee et al., 2018).

Measuring HL and illness knowledge such as DM supports the direction of health education initiatives by maximizing information access for self-care and minimizing diabetic distress.

Hypothesis I concerning diabetic knowledge for the participants:

The present study findings revealed that there was improved in mean and standard deviation post HL sessions than pre in diabetic knowledge of the participants as well as total score.

Moreover, the majority of the participants had low diabetic knowledge pre HL sessions, while the majority of the participants had good diabetic knowledge post HL sessions. As well as, there were significant statistically differences between pre and post HL sessions. From the point of view of the researchers, it is an expected outcome as participants have received educational information that raises their knowledge. This current findings were supported by Tamiru et al., (2023) reported that there was a statistically significant higher mean score difference in knowledge after the delivery of diabetic self-management education ($p < 0.05$).

Moreover, Emmanuel et al., (2017) in agreeing with the current study findings as they reported that their findings indicated that participants' knowledge of diabetes self-management had improved two weeks after the intervention when compared to before the intervention as well as there was a statistically significant difference between the effects of nurse-led training on knowledge of diabetes self-management among diabetic patients before and after the intervention. Moreover, this finding supports with the study performed by Berard et al., (2015) their findings demonstrated an increase in knowledge regarding diabetes self-management among diabetes outpatients post-intervention when compared with pre-intervention knowledge scores.

Hypothesis II regarding health literacy (HL):

The current study results portray that in pre HL sessions, the majority of the diabetic patients had low HL, although in post sessions the minority of them had low health literacy. Moreover, there were increased in mean and standard deviation of overall score post sessions.

Wungrath and Mongkol (2020) was in line with the findings of the current study since they stated that their study indicated that after completing a program to improve HL, participants' posttest mean HL scores were higher than their pretest mean scores. In addition to, the present findings were agreed with ALSharit and Alhalal (2022) who discovered that the majority of type 2 DM patients had low HL. In addition to, the present findings were consistent with Haun et al., (2015) who stated that prior research conducted in various parts of the world found that 32.9–64% of diabetes patients had low or limited levels of HL.

Also, the current findings were in line with those of Noroozi et al. (2019) and Izadirad & Zareban (2015), who discovered that the majority of patients with type 2 diabetes had low HL.

Hypothesis III regarding self-care practices:

The current study found that there were increased in mean and standard deviation post HL sessions than pre concerning diet, physical activity, blood glucose monitoring, foot care and medication compliance as well as, total score. Moreover, there were

significant statistically differences between pre and post HL sessions. These obtained results show the benefits of HL for diabetes patients' ongoing education and self-care practices. The ability of patients to regulate their diabetes and the development of their self-care abilities can both be positively impacted by self-care HL sessions. The findings agrees with Zandiyeh et al., (2015) their study's findings indicated that there was no difference between the two groups' pre-intervention self-care mean scores ($P = 0.92$), but that the study group's self-care mean score was considerably higher than the control group's ($P = 0.00$). Moreover, the study findings supports with Emmanuel et al., (2017) and Dilla et al., (2013) according to their studies, their participants' diabetic self-care practices were increased after the intervention compared to before it.

Hypothesis IV concerning diabetic distress:

The present findings demonstrated that there were decreased in mean and standard deviation post than pre HL sessions regarding total score of diabetic distress as well as there were significant statistically differences between pre and post HL sessions. As well as, in pre HL sessions 5% of the participants had no| little distress; and 75% had high distress. While, in post HL sessions 79% of the participants had no| little distress; and 10% of participants had high distress. From the point of view of the researchers, it is an expected outcome as the participants have received health literacy sessions on self-care management that enhances

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their level of practice and knowledge, which has a positive impact on their health literacy that lessen their distress status. This results is consistent with Powers et al., (2015) who claimed that following the educational intervention, the intervention group's diabetic distress level decreased more noticeably than the control group. Additionally, similar findings were offered by Baradaran et al., (2014) and Sakhar et al., (2013) who discovered that the majority of their diabetic patients experienced diabetes distress. On contrary, the findings of the study not match with Islam et al., (2013) mentioned that 51.5% of the adult type II DM patients reported little or no diabetic distress.

Correlations among health literacy and selected variables (age, patient knowledge, self-care practices and distress):

The correlation between health literacy (HL) and age:

The current findings found that there were positive correlations with statistical significance differences between HL and age. The present findings is not consistent with Mojgan et al., (2022) and Kooshyar et al. (2014) stated that aging was negatively correlated with HL because the passage of time since years of formal schooling and diminished sensory capacities as well as diminished cognitive function. From the researchers' point of view, the differences occur due to different age groups in the studies and in the current study the mean age was 41.6 ± 10.0 that

is considered the middle age period in which the persons eager and keen to have health knowledge about their disease.

The correlation between health literacy and patients' knowledge:

The current findings found that there were positive correlations with statistical significance differences between health literacy and patients' knowledge

The present findings is in the same line with ALSharit and Alhalal (2022); Ahmed et al., (2021) and Razazi et al., (2018) mentioned that presence of a positive association between patients' knowledge and HL, indicating that as patients' knowledge improved, literacy level also improved.

The correlation between health literacy and self-care practices:

The current findings found that there were positive correlations with statistical significance differences between health literacy and self-care. The current study finding is match with Mojgan et al., (2022) and Reisi et al. (2015) discovered a strong positive link between HL and self-care practice scores, indicating that patients with diabetes who had higher HL may have better self-care habits. Although, the results of the study is not match with Kim (2021) who claimed that diabetic self-care practices were not significantly affected by HL.

The correlation between health literacy and distress:

The current study revealed that there was a negative correlation between HL and distress of diabetic patients, from

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the researchers' point of view this occurred due to increase level of the participants' knowledge and health literacy that in turn lead to enhancing of their self-care practices and lowering their distress level.

Conclusion:

Diabetic self-care health literacy sessions led by nurses can enhance their knowledge and practices among diabetic outpatients and lower diabetic distress. According to the study, hospitals should routinely offer patients health literacy education and training on managing their disease

Recommendations

The current study was recommended that nurses should regularly perform health literacy sessions on diabetes self-care for diabetic patients to improve their knowledge and practices as well as lowering diabetic distress which is necessary to enhance their health outcomes. Setting up a patient education center in health care facilities for patients with diabetes is required to inform these patients about diabetes and its care.

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