

Relationship between Health Literacy and Treatment Burden among Patients with Multi-Morbidity

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Abstract

Background: Multi-morbidity is a public health concern which increases with age. Patients who fail to realize the health information provided by health care professionals besides the significance of their treatment can face a higher treatment burden.

Aim of the study: The study aim was to examine the relationship between health literacy and treatment burden among patients with multi-morbidity.

Design: A descriptive correlational research design was used.

Setting: The study was carried out in outpatient clinics at Shebin El-Kom university hospital and Menouf general hospital, Menoufia Governorate, Egypt.

Subject: A purposive sample of 480 multi-morbidity patients aged ≥ 20 years was selected.

Tools of the study: A Structured Interview Questionnaire, Multi-morbidity Status Assessment, Disease Burden Morbidity Assessment, Multi-morbidity Treatment Burden Questionnaire, and Health Literacy Questionnaire were used.

Results: The most reported chronic conditions were hypertension (45.0%), arthritis (40.5%), stomach problems (37.5%), and chronic back pain (35.2%). Half of the patients suffered from a high degree of treatment burden, which was significantly higher (59.8%) among patients aged ≥ 60 years than patients aged between 20 to 59 years old (43.4%). Moreover, 61.9% of the patients had low health literacy, they had difficulty in understanding health information and 63.3% are unable to engage with healthcare providers. Health literacy score was negatively correlated with treatment burden score, disease burden score, number of chronic conditions, and age, besides positively linked with self-perceived health.

Recommendations: There is a need for developing and implementing strategies that concentrate on enhancing health literacy skills for multi-morbidity patients to reduce the treatment burden for multiple chronic conditions.

Conclusion: Low health literacy and burden of treatment were significant health issues among the studied multi-morbidity patients. Multi-morbidity patients who cannot realize the health related information well and unable to communicate with healthcare professionals had a higher treatment burden.

Keywords: Health literacy • Treatment burden • Multi-morbidity Patients • Chronic conditions

Introduction

Multi-morbidity is generally the experiencing of two or more chronic conditions in the same person. It is becoming more frequent and a major health problem around the world [1]. A chronic condition is a physical or mental health problem that lasts more than a year and produces functional limitations or needs continuous professional care. [2]. Chronic diseases burden is becoming more global, in both developed and developing countries and account for nearly 70% of all mortality globally, with 85 percent of these deaths occurring in less developed countries [3].

Globally, it is becoming more common owing to lifestyle changes, aging population [2,4], lowered thresholds for identification, presence of new diagnoses, and increased life expectancy which raises the occurrence of certain chronic diseases [5]. The World Health Organization (WHO), estimates that 422 million persons worldwide have diabetes and 1.13 billion have hypertension [6]. Also, chronic kidney disease affects 750 million persons worldwide [7]. In primary healthcare and clinical settings, mixes of these conditions are more [8]. The most frequent causes for chronic conditions include smoking, elevated body weight, besides a high

dietary salt intake and when one disease develops; its consequences also contribute to the emergence of other chronic conditions [9].

The prevalence of multi-morbidity across all age groups was 52.2%, and rises with age, almost 72% of individuals over 60 years. Multi-morbidity in those under the age of 20 years was 6.2%, and in 21-40 years was 18.9% compared with 44.7%, in the age groups 41-60 years, 71.6% among 61-80 years and 85.8% in the age group above 80 years [1]. According to the WHO, chronic diseases have reached epidemic proportions and constitute the main reason of death (75% of deaths) as well as disability worldwide [10]. It is responsible for 68% (38 million) of deaths in 2012 and will increase to 52 million by 2030 [11]. In Egypt, between the ages of 30 and 70, the risk of premature death due to chronic diseases was approximately 28% [12].

Multi-morbidity is linked to increased disease burden, worse health consequences, and lower quality of life [13], frequent hospital visits, a greater proportion of provider visits, long stay in hospitals, complex self-care needs, reduced levels of function, and increasing healthcare budgets [14,15], greater mortality and disability [16]. Also, experience a deficiency of continuity care and poor communication with healthcare providers [17]. Besides, it is linked to polypharmacy and possibly adverse effect on patient

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safety like as treatment interaction [18]. Moreover, multi-morbidity patients are suffering difficulties with access to information deficiency of treatments coordination [19,20].

Treatment burden is identified as the patient's perception of the "aggregate weight of the actions and resources they devote to their healthcare, comprising difficulty, time, and out-of-pocket costs linked to the health care practices in accordance with treatments, nutritional recommendations, and self-monitoring" [21]. Also, it is recognized as the workload that health care places on patients and its effect on their safety. Patient workload contains all demands in a patient's life for health-related actions as arranging and attending visits, preventive treatment, self-monitoring, visits to the physician, medical testing, lifestyle changes [22, 23], time necessary to plan and organize travel for obtaining treatment, cost of treatment, long travel to health care professional appointments, learning about medications and their adverse reactions, and interacting with others [24].

Multi-morbidity individuals are at risk of having a high workload. They are frequently needed to participate in complicated therapy and self-management measures to preserve health and look for care from different providers that may result in disorganized and poorly cooperation of services [25]. It makes more challenging for persons to realize and coordinate their many health-care medications on a daily basis and multi-morbidity persons usually feel burdened in managing their illnesses. Coping with the self-management burdens needs a lot of effort, time, and skills such as literacy [23].

Health literacy (HL) is identified as an ability of individual's to gain and interpret knowledge and information to preserve and enhance health in ways that are relevant to their individual and system frameworks [26]. Concerning WHO, HL is recognized as "the individual characteristics and social resources essential for individuals and society to access, realize, assess, and utilize information and services for making health decisions" [27]. This involves personal knowledge, motivation, and skills as understanding health information and active engagement with healthcare providers and the ability to take measures to develop individual and community health through altering individual behaviors and living conditions. It can change by building competencies or enhancing health services and can be a vital, modifiable factor of self-care and health behavior [28].

The presence of literacy skills enables persons to work in knowledgeable conditions in healthcare and improves their capability to use preventive services for health management. Persons with better HL are more likely to participate in the care besides encouraged to effectively care for them, to achieve prescribed treatments prior visiting a healthcare provider, and to access required services within their family or social structure, community, or healthcare organization [29]. Centers for Disease Control and Prevention [CDC] reported that low HL influences several forms of health problems, is an obstacle to self-management, and may raise likelihood of negative health consequences and rise costs [30]. Persons with low HL are less aware of their health, have an inadequate understanding of the global significance of protective measures in preserving and managing good health [31], and those who reported poor health consequences often have the most inadequate literacy, numeracy, and HL skills [30]. Also, low HL is related to poor health outcomes with increased mortality risks [32] reduced abilities to take drugs as recommended or adhere to medications, diminished abilities to read and understand labels, and inability to coordinate needed support from family, community, or health care system [33].

It is vital for the health organization design for moving away from a single-disease context to a patient-centered approach that manages with multiple chronic conditions [15]. As a result, we should concentrate on strategies to best support patients who have multiple chronic diseases [34]. Individuals with multi-morbidity find it extremely difficult to perceive and handle a various health care management on a daily basis. Healthcare providers must focus on developing and maintaining positive relationships with patients, and implementing strategies to help patients understand complicated health data [8].

Additionally, health providers should be aware of the literacy skills of their patients, to ensure that health information is effectively discussed to assist in the treatment of long-term conditions [35]. Nurses are the best-equipped healthcare practitioners to overcome health disparities among patients with poor HL. Nurses should be aware of HL and the effects of poor HL on their patients' health. As a result, nurses must be competent in promoting and delivering programs aimed at improving HL. Nurses must also be capable of evaluating patients' HL and modifying their communication styles to assist patients with poor HL in implementing the required habits to enhance their health [36]. Therefore, it is important to examine the relationship between HL and treatment burden among patients with multi-morbidity.

Significance of the study

Multi-morbidity is becoming a globally public health issue, and the prevalence increases with age [1]. Worldwide approximately one in three (33.3%) of all adults suffer from multiple chronic conditions [15]. The number is probably to three out of four (75%) in older adults and predicted to rise [2]. Between 2015 and 2035, multi-morbidity prevalence is expected to increase, with the percentage of four diseases nearly doubling [37]. The burden of chronic diseases in Egypt constitutes a major burden over the health organization and is considered the main challenge for socioeconomic development in the country. About 84% of total mortality in Egypt is attributed to chronic diseases [3]. Also, multi-morbidity patients are more likely to have a high treatment burden [23]. It is linked to decreased quality of life and compliance to medication [38], high hospitalization and mortality [32]. Identifying the burden of treatment is very important due to the growing occurrence of multi-morbidity in many countries [37].

Individuals with poor HL may be incapable to interpret and use health information effectively in ways that preserves and enhances health; they have poor health outcomes and lower medication adherence [8,39]. So far, many other researches have concentrated on HL in the framework of single diseases [40,41]. The suffering in HL experienced by persons who have multi-morbidity is not well recognized [8].

High HL levels can improve the patient capability; and tend to be protective against facing a high care burden. In contrast, patients, who fail to realize the information provided by the health care professionals, besides the significance of their treatment, can face a high treatment burden [23]. Understanding patients' levels of HL and adjusting their communication patterns in a person-centered approach is a core nursing skill [42]. So, it is a significant role for the geriatric and community health nurses to examine the relationship between HL and treatment burden among patients with multi-morbidity.

The aim of the study

To examine the relationship between health literacy and treatment burden among patients with multi-morbidity.

Research questions

- What are the degrees of treatment burden among multi-morbidity patients?
- What are the HL levels among multi-morbidity patients?
- Is there a relationship between HL domains and treatment burden degree?
- Is there a relationship between HL score, treatment burden score, burden of disease score, self-perceived health, number of chronic conditions, and age?
- Is there a difference between adults and elderly patients in relation to treatment burden degree?
- What are the types of treatment burden caused by multi-morbidity?

Materials and Methods

Design

A descriptive correlational research design was utilized to accomplish the study aim.

Setting

The study was conducted at outpatient clinics in university hospital in Shebin El-Kom City and Menouf general hospital at Menouf City, Menoufia Governorate, Egypt.

Subject

A purposive sample was recruited, utilizing the non-probability sampling technique. It included a total of 480 patients with multi-morbidity, attending outpatient clinics for routine care in university hospital at Shebin Elkom city and Menouf general hospital at Menoufia Governorate, Egypt. The study subjects were selected depending on the following inclusion criteria: adult aged 20-59 years and elderly patient's ≥ 60 years old, both sexes, had two or more chronic health conditions like hypertension, diabetes mellitus, asthma, chronic obstructive pulmonary disease, etc., able to respond to written and oral questions, and agree to participate in the study.

Sample size

The researchers used the online creative research systems sample size calculator website to determine the appropriate sample size. It was examined, reviewed, and double-checked for calculated outcomes based on well-known formulas for common study aims [43]. The sample size was calculated based on the annual flow rate of clients who met particular inclusion criteria. The needed sample size was 480 patients with multi-morbidity, with a 95% level of confidence (error=5 %) and a study power of 95%.

Tools for data collection

Data was collected using five different tools; as follows:

Structured interview questionnaire

It was developed by the researchers after broad literature review and comprised of the following

Demographic characteristics: These comprised the client's age, sex, residence, and level of education.

Health related data: It included questions about number of chronic conditions, medications use, and physical activity practice at least 30 minutes three times per week, smoking habits, weight and height to measure body mass index (BMI). It was determined by dividing body weight (kg) via height squared (m^2).

Self-perceived health: It was measured by asking each participant about how are you overall health during the last twelve months, and response options on five point Likert scale ranging from 1 (very poor) to 5 (very good). While for analysis; a four-point scale was used.

Multi-morbidity status assessment

Multi-morbidity was defined as two or more chronic conditions that affect an individual simultaneously [44]. After extended reviewing of previous research studies about assessment of multi-morbidity status to determine the common chronic health conditions [45-48]. We used a list of 21 common chronic health conditions that can be reported by participants. The presence of chronic health conditions was determined by asking every participant to check "yes" only for conditions that confirmed via a physician from a list composed of 21 common chronic conditions included high blood pressure, high cholesterol, diabetes, thyroid disorder, respiratory diseases (asthma, chronic bronchitis/COPD), chronic back pain or sciatica, arthritis/rheumatoid arthritis, stomach problem as an ulcer or gastritis, colon problem such as irritable bowel or ulcerative colitis, poor blood circulation (e.g., peripheral vascular disease), overweight/obesity, hard of hearing,

vision problem, osteoporosis, cancer within the past 5 years, (excluding skin cancers), kidney disease, chronic liver diseases, cardiac diseases (coronary heart disease, heart failure, arrhythmia), stroke, neurologic diseases (epilepsy, dementia, Parkinson's disease), depression or anxiety. The response options for each problem in the form of yes or no.

Disease Burden Morbidity Assessment (DBMA)

It was developed by Bayliss et al., 2009 [45] and checked for validity and reliability by Poitras et al., 2012 [46]. It measures the effect of chronic conditions on everyday activities as indicators of disease severity. It used by researchers to assess burden of the disease experienced by patients. For each identified chronic health condition, participants were asked about the degree to which the chronic health condition limited their daily activities. The responses option were rated on a five points likert scale ranged from one point ("not at all" limiting daily activities) to five points ("a lot" interferes with daily activities). Moreover, any chronic health conditions not involved in the identified list had scored them in the similar method. The sum of the limitation activity score from each chronic condition, containing those added by the patient representing DBMA total score.

Multi-morbidity Treatment Burden Questionnaire (MTBQ)

This scale was developed and validated by Duncan et al., 2018 [49]. It was used to measure treatment burden in individuals with multiple chronic conditions. It is a concise, simple-worded of items and composed of ten items that involved burden of controlling health conditions (e.g., monitoring health conditions as blood pressure checking, lifestyle changes as diet and exercise, obtaining clear and current information about health condition); medication related burden (e.g., remembering when and how take drugs), burden to see a variety of healthcare professionals and arranging appointments with healthcare and the burden of relying on family and friends.

MTBQ scoring

Each item is rated as not difficult (zero), a little difficult (one), quite difficult (two), very difficult (three), extremely difficult (four). To calculate MTBQ overall score, the mean score from the answered questions was calculated for each participant and multiply by 25 to provide a value between 0 and 100. From MTBQ total scores, four groups were created, no burden (score 0), low burden (<10), medium burden (10-22), high burden (≥ 22).

Health Literacy Questionnaire (HLQ)

It was developed and validated by Osborne et al., 2013 [50]. It is validated tool measure HL and composed of nine different domains. In the current study, HL was assessed by two of nine HLQ domains called "understanding health information well enough to know what to do" and "ability to engage actively with health care providers". Every domain involves five items and the response of every item is designated on four point Likert scale, 1(very difficult), 2 (difficult), 3 (easy), and 4 (very easy). To obtain a scale score, the scores of the 5 items were added together and divided by the number of answered items in the subscale. Then, the overall subscale scores were computed for every participant as the mean scores of the five-item range 1-4. Each subscale was classified into low HL (score ≤ 2) to detect participants who are difficult or very difficult to understand information related health or unable to communicate actively with health care professionals, while high HL (score>2) for participants who are easy and able to understand health related information or communicate actively with healthcare professionals. Two domains were taken because they cover two different and vital aspects of HL that provide useful insight into the HL challenges of persons with chronic conditions.

Validity and reliability of the tools

The study tools were translated into Arabic language via two English-Arabic specialists. The Arabic form was then translated into English and any difference in the meaning taken into account. The content validity of the Arabic version of the tools were tested by a panel of three experts in the fields of community health nursing, geriatric nursing and community medicine. Changes were achieved in accordance with

the panel recommendations regarding the clarity of the statements and appropriateness of the contents. A reliability analysis was estimated via test retest method with two weeks apart between them. Correlation coefficient (Cronbach's alpha) was calculated between the two scores. The Cronbach's alpha coefficient value for multi-morbidity status assessment tool and DBMA were 0.81 and 0.86 respectively. Added to that, the Cronbach's alpha coefficient value for MTBQ was 0.89, HLQ two domains was 0.81 for understanding and 0.85 for engagement. This shows good reliability of the tools for conducting this research study.

Pilot study

A Pilot study was performed on 10% of patients with multi-morbidity. It was carried out to measure the applicability and clearness of the constructed questionnaire, time needed to answer the questions and detect any issue that might arise during data collection. Then the required changes and clarifications of some questions were completed according to the results of the pilot study and the last structure was designed and utilized in data collection. To ensure stability of the answers, the pilot sample was not included in the total sample of the research work.

Ethical considerations and human rights

In conducting the research, the researchers complied with all ethical concerns. The subjects were informed that their participation in the research was completely voluntary and that they could withdraw at any time; the participants' privacy and anonymity were respected. Patients' informed consent was also obtained to participate in the study. Before completing the questionnaires, the purpose of the study were explained to participants.

Data collection procedure

- Data was collected from the first of March 2019 and completed by the end of October 2019.

- The researchers have developed study tools based on the literature that encompass all aspects of the issue using textbook, periodical articles, and network sources.

- Before starting any step in the study, an official written approval was obtained from the directors of the hospitals where the study intended to be done after explanation its purpose.

- Validity, reliability, and a pilot study were performed before beginning data collection.

- Prior to data collection, informed consent obtained from each subject in the study.

- Data collection was collected from subjects who achieved the selection criteria two days a week through an interviewing questionnaire with each subject by the researchers individually using the studied tools.

- Then subjects have informed about the study's purpose, the participation was voluntary and they had the opportunity to refuse. The

subjects of the study were informed that they could refuse to answer any questions and that they could end the interview at any time. The researcher carried out the interview face-to-face with each patient in the waiting room.

- The average duration taken to complete the questionnaire forms was 25-30 minutes.

Statistical analysis

The data were coded, entered and analyzed using the statistical package for social science (SPSS) version 20. The quantitative data was analyzed as a number and a percentage, as well as a mean (X) and \pm standard deviation (SD). The qualitative data were presented in form of frequency tables, numbers, and percentages. It was examined by chi-square (χ^2) test. The independent-sample T test was utilized to compare between two means. The correlation between quantitative variables was determined using the Pearson correlation coefficient test (r). The significance level was taken at $p < 0.05$.

Results

Table 1 shows that 59.4% of the participants were adult patients aged between 20 to 59 years old and 40.6% of them were elderly aged ≥ 60 years. Additionally, the mean number of chronic conditions was significantly increased with age ($P < 0.001$). Besides, 60.0% of the participants were females, and the mean number of chronic conditions was statistically significant higher among females (5.16 ± 1.7) than males (3.31 ± 1.1) ($P < 0.001$). Regarding to the educational level, there was a significant decrease in mean number of chronic diseases with increasing the educational level ($P < 0.001$). Moreover, the patients who had overweight, obesity, inactivity, and smoking had a statistically significant more number of chronic conditions ($P < 0.001$).

Figure 1 illustrates that hypertension (45.0%) was the most reported chronic disease among the studied participants followed by arthritis (40.5%), stomach problems (37.5%), chronic back pain (35.2%), colon problems (31.8%), vision problems (31.0%), high cholesterol (29.0%), urinary problems (20.0%), diabetes (17.5%), respiratory diseases (17.5%), osteoporosis (15.0%), thyroid disease (11.0%), chronic liver disease (10.0%), cardiac disease (7.5%), and cancer (5.0%).

Figure 2 reveals that half (50%) of studied participants suffered from a high degree of treatment burden and more than one third (35.0%) had moderate burden, while only 15.0% of them had low degree of multi-morbidity treatment burden.

Figure 3 illustrates that 61.9% of the studied participants had low HL, they had difficulty in understanding the information related health well; and 63.3% were unable to engage with healthcare professionals. Besides, the mean score of understanding health information domain was 2.41 ± 0.95 and the "engagement with healthcare providers" domain was 2.43 ± 1.2 .

Table 1. Distribution of demographic characteristics and health related data by mean number of chronic conditions among the studied participants (N=480).

Demographic characteristics and health related data	Number of chronic conditions Mean \pm SD	Total sample %	P-value
Age (years)			
20- 59	3.2 ± 1.01	59.40%	$t=31.0$; $p < 0.001$
≥ 60	6.1 ± 1.01	40.60%	
Mean \pm SD	53.1 ± 11.5		
Sex			
Male	3.31 ± 1.1	40.00%	$t=13.1$; $p < 0.001$
Female	5.16 ± 1.7	60.00%	
Residence			
Rural	4.42 ± 1.8	64.60%	$t=0.1$; $p > 0.05$
Urban	4.43 ± 1.63	35.40%	
Education level			

No read and write	5.5 ± 0.5	10.20%	F=65.8; P<0.001
Basic education	5.8 ± 1.8	24.80%	
Moderate education	3.64 ± 0.9	34.80%	
High education	3.8 ± 1.8	30.20%	
Body Mass Index			
Underweight	3.1 ± 0.01	5.20%	F=6.8; P<0.001
Normal weight	4.45 ± 1.9	54.80%	
Overweight	4.4 ± 0.8	25.00%	
Obese	4.8 ± 2.2	15.00%	
Physical activity			
Yes	3.9 ± 1.7		0.30
No	4.95 ± 1.9		0.30
Smoking	30.00%		0.30
Number of cigarettes/day	16.6 ± 4.7		0.30

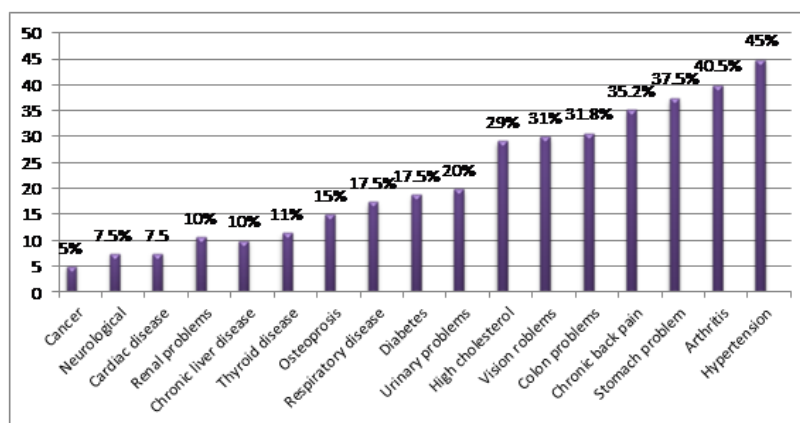


Figure 1. Distribution of chronic conditions among the studied participants (N=480).

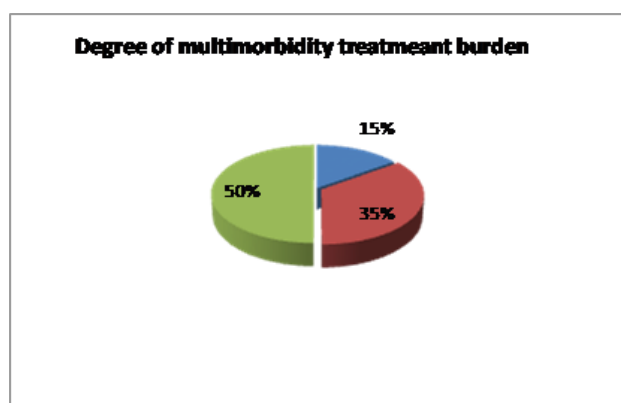


Figure 2. Distribution of treatment burden degrees among the studied participants (N=480). Note: (■) Low burden, (■) Moderate burden, (■) High burden

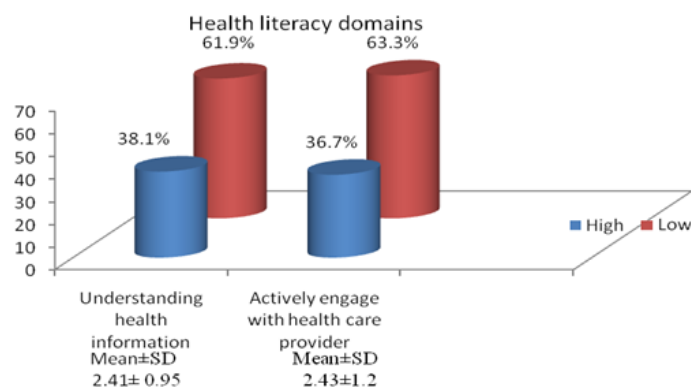


Figure 3. Distribution of health literacy domains among the studied participants (N=480).

Table 2 reveals that more than half of the studied participants (58.2 % and 57.9% respectively) who had low HL (difficult or very difficult to understand information related health or unable to communicate actively with health care professionals) were suffered from a high degree of treatment burden. On the other hand, the participants who had a better level of understanding the health information and able to communicate with healthcare providers had a lower level of burden with statistically significant difference in HL domains in relation to degrees of burden ($p < 0.0001$).

Table 3 illustrates that there was a statistically significant positive correlation between HL score and self-perceived health ($r = 0.33, P = 0.000$). These results indicate that understanding the information about health and engage actively with healthcare providers associated with good self-perceived health. Also, there was a statistically significant negative correlation between HL score and treatment burden total score ($r = -0.21, P = 0.009$), disease burden morbidity assessment total score ($r = -0.42, P = 0.000$), number of chronic conditions ($r = -0.39, P = 0.000$), and age ($r = -0.54, P = 0.000$). These results indicate that difficult or very difficult to realize information related health or unable to communicate actively with health care professionals linked to an increased level of burden, increased number of chronic diseases and age.

Table 4 displays that multi-morbidity treatment burden total score was a statistically significant positive correlated with disease burden assessment score ($r = 0.71, P = 0.000$) and number of chronic conditions ($r = 0.70, P = 0.000$). This indicates that the high treatment burden was associated

with higher disease burden and increased number of chronic conditions. Moreover, treatment burden total score negatively correlated with self-perceived health ($r = -0.58, P = 0.000$). This indicates that low treatment burden associated with good perceived health. Disease burden was positively correlated with number of chronic conditions ($r = 0.82, P = 0.000$) and negatively correlated with self-perceived health ($r = -0.72, P = 0.000$). Also, the number of chronic conditions negatively correlated with self-perceived health ($r = -0.51, P = 0.000$).

Table 5 reveals that 41.6% of the adult participants had a good self-perceived health and 43.4% had high degree of treatment burden. In contrast, 50.0% of the elderly had poor self-perceived health and 59.8% had high degree of treatment burden with statistically significant difference between adult and elderly patients. These results indicate that multi-morbidity affects negatively on the patients self-perceived health and cause different degrees of burden ($p < 0.001$).

Table 6 demonstrates the different categories of treatment burden influence on the adults and elderly with multi-morbidity included medication related burden, cost burden, lifestyle modifications, contact with the health care providers, burden of dependence on friends and family, teaching about condition, and burden of managing health conditions. There was a significant difference between the adults and elderly in relation to different categories of treatment burden ($p < 0.001$). However, the financial burden was relatively similar among the two groups ($p > 0.05$).

Table 2. Distribution of treatment burden degrees by health literacy domains among the studied participants (N=480).

Treatment burden degree	Health literacy				P value	Ability to engage with healthcare providers				P value
	Understand health information well enough					Ability to engage with healthcare providers				
	High		Low			High		Low		
No.	%	No.	%	No.	%	No.	%			
Low burden	53	29	19	6.4	47	26.7	25	8.2		
Moderate burden	63	34.4	105	35.4	$\chi^2=49.1$	65	36.9	103	33.9	$\chi^2=36.01$
High burden	67	36.6	173	58.2	$p < 0.0001$	64	36.4	176	57.9	$p < 0.0001$
Total	183	100	297	100		176	100	304	100	

Table 3. Correlation between health literacy, multi-morbidity treatment burdens, disease burden, numbers of chronic conditions, age and self-perceived health.

Variables	Health literacy	
	r	P value
Multi-morbidity treatment burden total score	-0.21*	P= .008
Disease burden morbidity assessment total score	- 0.42*	P= .000
Number of chronic conditions	-0.39*	P= .000
Self-Perceived health	0.33*	P= .000
Age	-0.54*	P= .000

*Correlation is significant at 0.01 level (2-tailed) Correlation is significant at 0.01 level (2-tailed).

Table 4. Pearson correlation (r) matrix between multi-morbidity treatment burden, burden of disease, number of chronic conditions, and self-perceived health.

Variables	Multi-morbidity treatment burden	Disease burden	Number of chronic conditions	Self- Perceived health
Multi-morbidity treatment burden total score				
Disease burden total score	$r = 0.71^*$ $P = 0.000$			
Number of chronic conditions	$r = 0.70^*$ $P = 0.000$	$r = 0.82^*$ $P = 0.000$		
Self-Perceived health	$r = -0.58^*$ $P = 0.000$	$r = -0.72^*$ $P = 0.000$	$r = -0.51^*$ $P = .004$	

*Correlation is significant at 0.01 level (2-tailed)

Table 5. Distribution of self -perceived health and treatment burden degree by age categories of the studied participants (N=480).

Variables	Adult (20-59 years) (N=286)		Elderly (≥ 60 years) N=194		P value
	No.	%	No.	%	
Self -perceived health					
Poor	72	25.2	97	50	χ ² =97.1 p<0.001
Fair	49	17.1	71	36.6	
Good	119	41.6	24	12.4	
Very good	46	16.1	2	1	
Degree of treatment burden					
Low burden	71	24.8	1	0.5	χ ² =53.8 p<0.001
Moderate burden	91	31.8	77	39.7	
High burden	124	43.4	116	59.8	

Table 6. Mean score of treatment burden types by age categories of studied participants (N=480).

Aspects of treatment Burden	116		P value
	Adult (20-59 years) (N=286)	Elderly (≥ 60 years) (N=194)	
	Mean ± SD	Mean ± SD	
Medication related burden			
Take several medications	2.9 ± 0.9	4.1 ± 1.3	t=-12.6; p<0.001
Realize when and how drug can be taken	1.91 ± 1.03	2.62 ± 0.9	t=7.4; p<0.001
Cost burden			
Paying for prescription drugs, over-the-counter treatments, or devices	1.58 ± 1.2	1.5 ± 1.5	t=0.6; p>0.05
Lifestyle modifications			
Changing lifestyle (e.g., diet and exercise) as suggested	2.1 ± 1.1	2.8 ± 0.6	t=-7.4, p<0.001
Contact with the healthcare providers			
Organizing appointments with health care providers	2.1 ± 0.9	2.7 ± 1.6	t=-6.4 , p<0.001
Seeing a variety of health care providers	2.1 ± 1.01	3.2 ± 1.3	t=11.4 , p<0.001
Attending doctor visits e.g., taking time off work, transport arrangements)	1.8 ± 0.9	2.4 ± 0.8	t=-6.2, p<0.001
Burden of depending on friends and family			
Depend on family and friends for assistance	1.75 ± 1.09	2.4 ± 1.1	t= -6.1, p<0.001
Teaching about condition			
Getting clear and current data about health condition	1.1 ± 0.1	1.5 ± 0.5	t=4.8, p<0.001
Burden of managing health conditions			
Checking health conditions such as blood pressure and glucose levels	2.1 ± 0.9	2.5 ± 1.1	t=3.4, p<0.001

Discussion

Multi-morbidity patients are at a higher risk for safety issues for a variety of reasons, as polypharmacy that may lead to negative adherence to drugs and adverse drug reactions; complex management regimens; complex interactions with health services that lead to higher susceptibility to failures in care delivery and cooperation; need for clear communication and patient-centered care because of complex needs; increased susceptibility to safety concerns owing to poor health, advanced age, and low HL [51]. Individuals with multi-morbidity find it much more difficult to comprehend and handle health care treatments on a daily basis [8]. To minimize the burden of illness, multiple chronic conditions need particular attention [52]. So, the present research aim was to examine the relationship between HL and treatment burden among patients with multi-morbidity.

The present study results showed that about sixty percent of the participants were adult patients aged between 20 to 59 years old and about forty percent of them were elderly aged ≥ 60 years. The mean number

of chronic conditions was significant increased with age. This result was in agreement with Cassell et al., 2018 [44] showed that the occurrence of multi-morbidity in primary care in England was significantly higher with increased age. Similarly, Singh et al., 2019 [53] discovered a positive relationship between age and multi-morbidity. Moreover, results given by Sangeeta [54] revealed that the proportion of adults with numerous chronic conditions rises with age, and the percentage is highest for those aged 65 and older in Delaware. Likewise, Zhang et al., 2020 [55] concluded that, the percentage of multi-morbidity in older adults in China increased with age.

The results of the present study reported that, the mean number of chronic conditions was significantly higher among females than males (P<0.001). This result consistent with Anna et al., [44,56-58] revealed that multi-morbidity had a significant higher in women than men. Likewise, results of other studies by Buttorff et al., [2,54] revealed that women more vulnerable than men to have two or more chronic conditions. In contrast, other studies by Zhang et al., [55,59] showed that multi-morbidity in older adult was higher in men than women. The present finding can be related to

the higher social burden of Egyptian women, which can lead to the higher morbidity percentage among women compared to men.

Regarding the educational level, the current result revealed that there was a significant decrease in mean number of chronic diseases with increasing the educational level ($P < 0.001$). Likewise, Rehr et al., 2018 [60] reported that the risk of multiple chronic diseases among adult Syrian refugees in northern Jordan was higher in patients with no or low education level. Similar results in Denmark [57,61] showed that multi-morbidity is negatively linked with educational attainment.

Obesity and lifestyle are important contributing factors for chronic diseases. The present finding showed the patients who had overweight, obesity, inactivity, and smoking had a significant more number of chronic conditions ($P < 0.001$). These results were supported by Zhang et al., [55] revealed that persons with abnormal BMI, reduced activity level, and smoking had greater multi-morbidity prevalence. Likewise, in South Asian [53] showed that BMI were related to multi-morbidity. Furthermore, the risk of multi-morbidity in low and middle income countries was higher in obese persons than normal weight group [62].

Regarding chronic conditions, the current study showed that, the most common chronic disease was hypertension as showed by less than half of participants, followed by forty percent had arthritis, overweight/obesity and more than one third had stomach problems, chronic back pain, and about one third had colon problems, vision problems, and more than one fourth had high cholesterol, then less than one fourth had urinary problems, diabetes, respiratory diseases, osteoporosis while the least frequent condition was cancer and neurological disease as dementia and Parkinson's disease. Likewise, Wang et al., 2020 [63] revealed that the most prevalent disease among middle-aged and older Chinese individuals was hypertension and osteoarthritis. Also, result of Wijers et al., [64] showed that hypertension, vision problems, overweight, and back pain were most frequently reported conditions in primary care users with multi-morbidity in England. Similarly Pedersen et al., [65] found that hypertension was the most frequent chronic health condition and osteoarthritis while the least frequent condition was Parkinson's disease in older adults in Spain.

Concerning treatment burden, the present study revealed that half of the studied patients suffered from high degree of treatment burden and more than one third had moderate burden, while only fifteen percent of them had low degree of treatment burden. Beside, elderly people had a significant higher treatment burden than younger people with multi-morbidity. The present study was inconsistent with Pedersen et al., [66] revealed that eighteen percent of patients with multi-morbidity in England reported a high treatment burden, 26.9% had medium burden, and 32.2% reported low treatment burden; and 22.9% reported no treatment burden. Younger age was linked to higher treatment burden.

Moreover, a study in Denmark [67] concluded that high treatment burden was experienced by thirteen percent of a general population. Younger people had a greater burden of treatment than old people. Likewise, result of in Danish, who reported that 19.9% had perceived high treatment burden, 20.9% had medium burden, 28.1% had low treatment burden, and 31.1% perceived low treatment burden. The disparity could be attributed to differences in the socio-demographic features of the current study participants and treatment of multiple chronic conditions that are often discussed in meetings with healthcare practitioners who specialize in a particular chronic condition.

Health literacy (HL) is recognized as a global health goal for improving health promotion via better education and communication strategies and improving health consequences of inadequate HL patients [32]. The WHO suggested HL as a tool to achieve numerous important objectives outlined in Sustainable Development Goals [26]. Nurses are well placed in a unique position in order to empower the patient and the family with instruction and to be fully involved in patient care. The assessment of a patient's HL needs to be a priority in the overall patient assessment [29].

The current results illustrated that about two thirds of the studied patients had low HL (difficulty in understanding the information related health well and are unable to communicate with healthcare professionals. The mean score of understanding domain was 2.41 ± 0.95 and the "engagement with healthcare providers" domain was 2.43 ± 1.2 . These were in harmony with a cross-sectional study performed among outpatient clinics patients at Ain-Shams University Hospitals, Egypt by Yadav et al., [68] stated the majority of participants had limited HL. Likewise, Yadav et al., 2020 [69] showed that across the five domains of the HL questionnaire, three-quarters of the multi-morbidity people in rural Nepal had poor HL. The average score for engagement was 2.02 ± 1.10 , and understanding information was 1.78 ± 0.99 . Similarly N'Goran et al., [70] showed that 54% of patients with chronic diseases in Nepal had insufficient HL, and 19% had problematic HL.

As regards the relation between HL and the treatment burden of multiple chronic conditions, the present study revealed a significant negative correlation between HL score and treatment burden total score. Also, more than half of the studied participants who had difficulty to realize health related information or unable to communicate with healthcare professionals were suffered from a high degree of treatment burden. On the other hand, the participants who had a better level of understanding information and able to participate with healthcare professionals had a lower level of burden ($p < 0.0001$). These results were confirmed by cross-sectional study in Switzerland [71] found multi-morbidity individuals with a high treatment burden frequently have low HL levels.

Consequently, primary care practitioners must pay attention to these patients in their daily practice. Similarly, a study in Dorset, England by Pedersen et al., [66] showed that low HL has strongly linked with high treatment burdens among multi-morbidity patients. Similar to Friis et al., [23] revealed that persons with multiple chronic diseases and difficulty in interpreting health related information were significantly more likely a high burden of treatment. HL is essential for patients to form appropriate choices. When patients cannot interpret oral or written information, they may feel burdened by therapy and this may result in non-compliance. Therefore, healthcare workers must use strategies for literacy to support their clients [23].

Regarding HL and its relation with self-perceived health, the current results revealed a statistically significant positive correlation between HL and self-perceived health. These results indicated that understanding information about health and engaged with healthcare professionals associated with good self-perceived health. The current results were consistent with Toci et al., [72] concluded positive correlations between two aspects of the HL and improved physical activity, and higher self-reported health status in individuals with cardiovascular disease. Similarly Todorovic et al., [73] found patients with low literacy were more likely to experience bad health than patients with sufficient literacy.

Concerning HL and its relation with age, and number of chronic conditions, the present finding showed a significant negative relationship between HL and disease burden, number of chronic conditions, and age ($p < 0.001$). These results displayed that difficult to recognize information related health or unable to interact with healthcare specialists linked with increased disease burden, increased number of chronic conditions and age. Likewise, results of [8] confirmed that higher HL was correlated with being younger than 65 years old and having fewer chronic conditions. Similarly, a study in Republic of Srpska, and Bosnia [74] showed that being 55 years of age or older, and having multiple long-term diseases, were linked to low HL. Also, results of Cabellos-García et al., [75] determined that individuals with multiple chronic conditions in Australia had lower HL domains than those with one chronic condition. Moreover, result of N'Goran et al., [70] found that insufficient HL was more prevalent in elderly patients with chronic diseases than in younger patients in Nepal. Additionally, Cabellos-García et al., 2020 [76] reported that age was significantly adverse linked to participation with healthcare professionals and the appropriate understanding of information to recognize what to do.

Multi-morbidity patients have a higher disease burden than patients with single disease and are more likely to have a high treatment burden [23]. These findings were consistent with the present results revealed that treatment burden total score had a positive correlation with disease burden score and number of chronic conditions, but negatively linked with perceived health status. This indicated that the high treatment burden was associated with higher disease burden and increased number of chronic conditions and poor health status. Likewise, results of Duncan et al., [49] confirmed a significant positive relation between treatment burden score, number of long-term illnesses, and score of disease burden. While, there was a negative relation with self-reported health. It may be due to a lot of treatment paths, time and travel costs, conflicting medical advices and inadequate coordination among healthcare providers.

Concerning the influence of multiple chronic diseases on the individual self-perceived health and disease burden, the current study showed that multi-morbidity affects negatively on the persons self-perceived health and positively correlated with disease burden. This result was in agreement with Cavalcanti et al., [77] showed that the greater number of chronic diseases was related to having a poorer self-perceived state of health. Likewise, a study in Canada [78] concluded that multi-morbidity can have a negative effect on the elderly's self-perception of their health. On the other hand, the current study showed that disease burden was negatively correlated with self-perceived health. Likewise, result of study in Spain [65] revealed that the burden of the disease was strongly negatively linked to self-perception health.

The present study showed a significant difference between the adults and elderly participants about self-perceived health, where revealed that one fourth of adult compared to half of elderly participants had a poor perceived health. This result was consistent with [78] showed that a self-perception of poor among the elderly with multi-morbidity in Brazil was 51.1%. Likewise, [73] reported that fifty two percent of older people in Kosovo have perceived poor health status. Similar to Van Merode et al., [79] in Canada, revealed that self-reported health status was found to be inversely linked to age.

There is no doubt that negative influence of treatment burden are various and include both a psychological and practical consequences, as disruption with daily tasks, negative feelings, and strained relationships [80]. The current findings showed a significant difference between the adults and elderly patients with multi-morbidity in various categories of treatment burden, including medication-related burden, lifestyle modifications, contact with health care providers, burden of depending on friends and family, teaching about condition, and burden of managing health conditions ($p < 0.001$). The cost burden was relatively similar among adult and elderly patients ($p > 0.05$).

These results were in accordance with Rosbach et al., [81] showed that patients living with multiple chronic illnesses face a growing treatment burden as a result of anything they do to maintain their health, including doctor visits, lifestyle modification, lab procedures and managing medications. Similar with a systematic analysis of qualitative information about treatment burden in multi-morbidity patients by [82] concluded that the treatment burden faced by multi-morbidity patients is complicated with several different elements interact with each other, and the most burdensome elements involved cost burden, poor education about treatment and conditions, adopting a proper diet and exercise habits, getting treatment, numerous visits to healthcare, and self-monitoring health conditions.

Additionally, results of Hajat et al., [83] clarified that multi-morbidity is linked to significant rises in healthcare costs and resource use due to increased use of primary care, specialized physicians visit, increased drug use and hospitalizations. Furthermore, the cost of chronic illness care can have a major impact on individuals and families in low-income communities. Finally, the multi-morbidity increases the burden of care on individuals while decreasing patients' ability to care for themselves [84].

Conclusion

This study indicated that half of the studied multi-morbidity patients suffered from high degree of treatment burden, and more than one third of them had moderate burden. Beside, high treatment burden was significant higher among elderly patients than adult patients. Moreover, about two thirds of patients had low HL where they had difficulty in understanding the information related health and inability to communicate with healthcare providers. Health literacy score was negatively correlated with treatment burden total score, disease burden total score, number of chronic conditions, and age, beside positively linked with self-perceived health. The different categories of treatment burden influence on the adults and elderly with multi-morbidity included medication related burden, cost burden, lifestyle modifications, contact with the healthcare providers, burden of depending on friends and family, teaching about condition, and burden of managing health conditions.

Recommendations

- The need for developing and implementing strategies that concentrates on enhancing health literacy skills of multi-morbidity patients to reduce the treatment burden of multiple chronic conditions.
- A comprehensive assessment of the literacy skills especially for multi-morbidity patients is required to address the challenges that face patients before instruction is provided.
- Healthcare providers in outpatient care settings must build trusting communication with patients and enable them in understanding and evaluating health related information.

Conflict of interest

There is no conflict of interest and no fund from any institution.

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