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Relationship between Caregivers' Beliefs about Medications and Medication Adherence in Children and Adolescents with Epilepsy

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Abstract

Introduction: Children with epilepsy need sustained drug treatment to achieve optimal and desired health outcomes. However, non-adherence to drug treatment is a common cause of adverse health outcomes in this population. This study aimed to investigate the relationship between caregivers' beliefs about antiepileptic drug therapy and adherence to medication in children and adolescents with epilepsy.

Methods: This correlational and cross-sectional study was conducted on 151 caregivers of children and adolescents with epilepsy aged between 2 months and 19 years old referred to the neurology clinic for epilepsy in Children's Hospital of Bandar Abbas, Iran. Data collection tools included demographic and general questionnaires; the Medication Adherence Report Scale (MARS) to assess medication adherence and the Beliefs about Medication Questionnaire (BMQ) for assessing the pharmaceutical beliefs of caregivers.

Results: Using quantile regression, there was no significant relationship between medication adherence and caregiver belief in the necessity of medications to control a child's epilepsy (P=0.38) and concern about the medications' side effects and efficacy (P=0.24). However, 47.7 % of caregivers reported full medication adherence.

Conclusions: Education about awareness of how to use and the effects of antiepileptic drugs is essential. By taking these actions, it is expected to increase medication adherence and following this, more appropriate control of epilepsy in children and adolescents.

INTRODUCTION

Epilepsy, as a neurological disorder, is defined as abnormal brain activity and its predisposition to generate seizures, unusual sensations or behavior, and in some cases, losing consciousness. Based on its classic definition, epilepsy as one of the most common neurologic disorders in children, is characterized by the recurrence of seizures over a long period [1-3]. It is estimated that in more than half of the cases, epileptic seizures begin in infancy [4]. Children with epilepsy should follow a treatment regimen that includes antiepileptic drugs for a long time to prevent seizures. If patients do not adhere to prescribed medication regimens, motor, physical, cognitive, and psychological consequences are inevitable [5]. Medication adherence

may be defined as "The patient's performance in following physician's medication prescriptions in terms of type, dose, frequency, and duration" [6, 7].

Patients show non-adherence to medication in various ways. Some may decrease the dosages of a drug, while others take an extra dose. Sometimes patients increase or decrease the number of times they take drugs. Occasional or complete discontinuation of taking medication indicates non-adherence [8]. Medication non-adherence as a serious condition, leads to significant deterioration of patients' health condition and well-being status alongside imposing a financial burden on the healthcare system [9, 10]. The reasons of non-adherence in child caregivers can occur for several reasons, including depression mood, lack of sufficient knowledge about the disease and the consequences of non-adherence to the treatment regimen, uncertainty about the effectiveness of drugs, concerns about the side effects of drugs, feeling dissatisfied with the high number of drugs and the need for long-term use [11, 12]. Poor adherence to long-term medications such as epilepsy has become a serious public health issue because it profoundly affects treatment efficacy [13]. Despite the knowledge about being a widespread condition and has consequences on the individual, family, and health system, the relevant factors of medication non-adherence and how to manage them are not clear enough [8]. Research shows that the correct use of drugs and medication adherence in patients depend on their caregivers' beliefs and attitudes regarding the effectiveness of prescription drugs [11, 12, 14-17]. Patients and their caregivers' beliefs about drugs have two aspects: concern about the side effects of drugs (Medication Concern) and belief in the need to take prescribed drugs (Medication Necessity) [15].

In this study, the Health Belief Model (HBM) built the conceptual framework due to the effect of an individual's attitudes and beliefs about health-related issues on adherence to medication [11]. The HBM, in addition to paying attention to the individual's attitudes and beliefs about a specific problem, also emphasizes the benefits and barriers to taking preventative actions that result from special behaviors [18]. The HBM usually includes five dimensions: perceived susceptibility, perceived severity, perceived benefits, perceived obstacles, and self-efficacy [19]. This study considered the perceived advantages and obstacles via caregivers. Perceived benefits and perceived obstacles mention to individual's prediction of the benefits of taking healthy behaviors and obstacles in taking healthy behaviors, respectively [17]. The HBM as a model has been used widely, for example explaining medication adherence in patients with hypertension, febrile convulsions, asthma, cancer, and kidney disease [15-17, 20]. To the best of our knowledge, there are few studies on medication adherence in children with epilepsy with contradictory results. In one study conducted in the USA, no significant correlation was reported between medication adherence and the caregivers' concerns about and attitudes toward the necessity of medication therapy [11]. On the other hand, in the study conducted in Northern Ireland, a positive correlation was reported between medication adherence and the caregivers' attitude toward the necessity of antiepileptic medications. Also, a negative correlation was found between medication adherence and the caregivers' concerns about medications [12]. According to the importance of medication adherence and caregivers' health beliefs in controlling epilepsy in children and reporting contradictory results from previous studies in this field, this study aimed to investigate the correlation between medication adherence and caregivers' beliefs regarding the necessity of taking medications and concerns about the effectiveness and safety of anti-epileptic medications in children with epilepsy.

METHODS

This correlational, cross-sectional study was conducted on caregivers of children with epilepsy, aged two months to 19 years old, and referred to the clinic of neurologic disorder in Children's Hospital in Bandar Abbas, Iran from August 2022 to November 2022. The caregiver was defined as the family member who has the primary responsibility of administering medication for the child. Inclusion criteria considered as: 1) Caregivers aged over 18 years old; 2) ability to read and speak Persian. Caregivers with Psychological disorders were excluded from the study. In general, 151 people met the criteria to be included in this study and were selected using a convenient sampling method.

One of the researchers visited the clinic every day from 16 to 21 o'clock to identify eligible persons and invite them to study. After ensuring that the inclusion criteria were met and explaining the study's objectives, the willing persons signed the informed consent, and then the questionnaires were filled out by them. In the cases of illiterate participants, one of the researchers read the questions and marked their answers on the form. The process of filling out the questionnaires took a maximum of ten minutes for each person. The purpose of this study was explained to the participants, and they were ensured of the confidentiality of their data. For this purpose, the questionnaires were provided to the participants in coded form and anonymously. Also, they signed a written consent form without any force, threats, or seduction.

Research Instrument

The research Instruments consisted of three parts. The first part was the demographic information form includes age, sex, relation with the child, level of education of the caregiver, age, and sex of the child, type of insurance, and the time between the last seizure and the age of diagnosis for the child.

The second part of the instrument was the Medication Adherence Report Scale (MARS). This scale was designed in 2000 by Thompson et al [21]. This scale had ten questions, each describing the patient's behavior regarding prescribed medications during the past week [22]. The developer reported Cronbach's alpha of the scale equal to 0.60- 0.75 [21]. In this study, the 5-item version of this questionnaire was used. The rating of this scale has been set, from 1 for to answer "always" to 5 for the answer "never". The first item of the MARS-5 is about unintentional nonadherence ("I forget to take my medication"), and the other four items assess intentional nonadherence (e.g., "I change the dosage of my medication"). Finally, adherence to medication score ranged from 5 to 25 and higher scores on MARS scale indicate higher adherence. The scale modified for patients with asthma was used in this study [23]. Translation, face, and content validity of this scale were done and confirmed. The term epilepsy was used instead of asthma in the translated version of the scale for the study population. Then, its readability and comprehensibility were evaluated (Cronbach's alpha: 0.81). In the study of Baljani et al., on cardiovascular patients, Cronbach's alpha was 0.96 [24]. The third part was the Beliefs about Medication Questionnaire (BMQ) to assess caregiver attitudes about prescribed medications for children. It consists of two sections, including (a) the necessity with five questions to rate the attitude about the necessity of taking the prescription medications, and (b) the concern with five questions to rate the attitude about the risk of medications such as dependence and side effects [25]. Responses have been determined based on a five-point Likert scale from "strongly disagree" with a score of 1 to "strongly agree" with a score of 5. So, for each subscale of BMQ, scores ranged from 5 to 25. The higher scores indicate a stronger attitude toward the necessity or concern about the medications [25]. The Cronbach's alpha of the scale ranged from 0.65 to 0.86 in the three studies used in various populations [11, 15, 26]. The same procedure applied to the previous scale was performed to determine the content and face validity. Its Cronbach's alpha was 0.83 in the present study.

Statistical Analysis

Continuous variables were reported using mean±SD and median (interquartile range); categorical variables were reported by number and percent. The normality of the dependent variable (medication adherence) was assessed by Shapiro-Wilk test ($P<0.05$) although the normality of caregivers' beliefs score was confirmed ($P>0.05$). Also, a scatterplot and Pearson's correlation were used for observing the linear relationship between the variables of medication adherence and the caregivers' beliefs about taking anti-epileptic drugs ($r=0.008$, $P=0.922$), therefore, assumptions of linear regression were not meet. As a result, quantile regression was used to estimate the relationship between medication adherence and caregiver beliefs about antiepileptic drugs for the necessity and concerns subscales, age of caregivers, sex of caregivers, education of caregivers, age of child, and the time past from the last seizure. Moreover, a multivariable linear regression model was used to find the relationship between caregiver beliefs about antiepileptic drugs and independent variables. All analyses were carried out using the Stata17 software and a $P < 0.05$ was considered as statistically significant. According to the study of Hagell et al [27] the data was divided into two groups of children aged two months to nine years and adolescents aged 10-19 years to help in a more precise comparison.

RESULTS

The demographic characteristics of the caregivers and children are presented in Table 1. The mean±SD scores of attitude about the necessity of medication to control a child's epilepsy, concern about the medications' side effects and efficacy, medication adherence, and full adherence score are shown in Table 2.

Table 1. Demographic characteristics of the caregivers and children

Caregiver Variables	Mean ± SD	Frequency (%)	Child variables	Mean ± SD	Frequency (%)
Age:	7.36±4.72 years		Age:	34.28±7.82 years	
18-34 years		82 (54.3)	2 months - 9 years		94(62.3)
35-60 years		69 (45.7)	10-19 years		57(37.7)
Sex:			Sex:		
Female		129 (85.4)	Female		65(43.0%)
Male		22 (14. 6)	Male		86(57.0%)
Level of education:	13.74±18.96 months		The time past from the last seizure:		
Illiterate		18 (11.9)	0-3 months		
Primary school		43 (28.5)	Above 3 months		
Middle school		28 (18.5)			64(42.4)
High school		37 (24.5)			87(57.6)
Bachelor and more		25 (16. 6)			
Relation with the child:	3.15±3.43 years		Age at diagnosis:		
Mother		126 (83.5)			
Father		20 (13.2)			
Sister		5 (3.3)			

Table 2. Distribution of scores of caregivers' beliefs about medication adherence

Variable	Mean±SD	Median (IQR*)	Minimum	Maximum
Necessity	12.44 ±3.54	12.00(10.00,15.00)	5	23
Concern	14.05±3.79	14.00(12.00,17.00)	5	22
Medication adherence	48.49± 2.47	49.00(48.00,50.00)	30	50
Full adherence		47.7%		

* Interquartile range

Table 3. Associations between caregiver beliefs about medications, adherence, and other variables

Variable	Model 1 (Response: Medication Adherence)			Model 2 (Response: Caregiver Belief score)		
	Coef (SE)	P	95%CI*	Coef (SE)	P	95%CI*
Age of caregivers (Reference:18-34 years)						
35-60 years	-0.07(0.50)	0.88	-1.06,0.92	-0.61(1.24)	0.62	-3.07,1.85
Sex of caregivers (Reference: Females)						
Males	-1.14(0.57)	0.04	-2.29, -0.01	1.77(1.43)	0.21	-1.05,4.59
Education of caregivers (Reference: Illiterate)						
Primary school	1.28(0.68)	0.06	-0.06,2.62	2.17(1.67)	0.19	-1.13,5.47
Middle school	0.24(0.76)	0.74	-1.26,1.75	3.28(1.86)	0.07	-0.39,6.95
High school	1.17(0.72)	0.10	-0.26,2.61	1.13(1.78)	0.52	-2.39,4.66
University	0.94(0.80)	0.23	-0.64,2.53	1.19(1.91)	0.53	-2.58,4.98
Age of child (Reference: 2months-9 years)						
10-19 years	-0.46(0.48)	0.34	-1.41,0.49	-3.07(1.16)	0.009	-5.37, -0.76
last seizure (Reference: 0-3 months)						
Above 3 months	0.61(0.41)	0.13	-0.19,1.42	2.38(0.98)	0.01	0.44,4.33
Necessity	-0.05(0.06)	0.40	-0.18,0.07	-	-	-
Concern	0.02(0.06)	0.77	-0.10,0.13	-	-	-

*Model1 is quantile regression to estimate the relationship between medication adherence, necessity and concerns subscales, age of caregivers, sex of caregivers, education of caregivers, age of child, and the time past from the last seizure; Model2 is linear regression to estimate the relationship between caregiver beliefs about antiepileptic drugs, age of caregivers, sex of caregivers, education of caregivers, age of child, and the time past from the last seizure; coef (SE): coefficient (standard error); 95%CI: 95% confidence interval.

Seventy- three (48.3%) and 72 (47.7%) of the participants had a strong belief about the necessity of antiepileptic medications (BMQ-specific scores above scale midpoint), and concerns about antiepileptic medication's harmful effects, respectively. The median score of concern about the medications' side effects and efficacy was higher in females than in their counterparts (Figure 1). Based on quantile regression, there was no significant relationship between medication adherence and caregiver belief in the necessity of medications to control a child's epilepsy (P=0.40) and concern about the medications' side effects and efficacy (P=0.77) (Table 3). Based on quantile regression, by adjusting the effect of other variables, the predicted value for the median score of medication adherence was 1.14 less in males than their counterparts (P=0.04) (Table 3). Based on linear regression, by adjusting the effect of other variables, the mean score of beliefs about medications in caregivers whose children were 10-19 years old was 3.07 less than those whose children were 2 months to 9 years old (P=0.009). Furthermore, the mean score of beliefs about medications in caregivers whose child's last seizure was more than 3 months was 2.38 more than those whose child had a seizure in the last 3 months (P=0.01) (Table 3).

DISCUSSION

This study aimed to investigate the relationship between caregivers' beliefs about antiepileptic drug therapy and adherence to medication in children and adolescents with epilepsy. No significant correlation was found between antiepileptic medication adherence and scores of the two subscales of BMQ, including the caregiver's attitude toward the necessity of the medication to control a child's epilepsy and concern about its side effects and efficacy. The findings are consistent with the findings of the previous study as their results did not show a significant correlation between medication adherence and caregiver belief about the necessity of the medication and concerns about the side effects and effectiveness [11]. The findings are not aligned with the findings of the previous study as their results reported a significant correlation between medication adherence and caregiver belief about the necessity of the medication and concerns about the side effects and effectiveness [28]. In another study, researchers found an association between nonadherence and parents' beliefs about the need for more antiepileptic drugs in managing their child's epilepsy. However, they reported that the overall effect on medication adherence was marginal [12]. Also, studies in adults with epilepsy reported that beliefs about antiepileptic drugs were not related to medication adherence [29, 30]. The correlation between medication adherence and belief about the necessity of medications and concerns about medication safety and efficacy is investigated in several other populations. In a study conducted on 324 patients with chronic heart disease, kidney disease, cancer, and asthma, significant correlations were found between patient belief about the necessity of medications and their medication adherence and concern about its side

effects [25]. However in another study, researchers reported that parents' beliefs about the need for asthma control medications were not related to medication adherence [31]. This contradiction can be due to different methodologies and sample sizes. Anyway, designing cohort studies can help to solve these contradictions.

Unexpectedly, in this study, no significant relationship was found between the main variables. However, many caregivers of children with epilepsy in this sample felt that their child's antiepileptic drugs were necessary for maintaining good health. Also, they had concerns about the side effects of the child's prescribed medications. This finding is partially consistent with the previous study [11]. In the current study, the median score of concern about the medications' side effects and efficacy is higher in females than in male caregivers. Although the previous study did not report a significant association between gender and participants' beliefs, they found that personal sensitivity to medicines scores were higher in females [32].

In the present study, the mean score of medication adherence was high (above scale midpoint). This finding is similar to the results of a previous study that reported a high percentage of adherent parents [28]. In the present study, 47.7% of the participants reported full medication adherence. This result is higher compared with the previous study where only 28% of their participants had a full score of medication adherence [11]. Most of the participants in this study were females, and based on the information in Table 3, the medication adherence score was significantly higher in female caregivers than in men. These findings can be an explanation for this high mean score of medication adherence. Another explanation for this finding could be that the caregivers report higher adherence due to bias of social desirability [33]. It can also be due to fatigue and lack of enough time by the caregivers to fill out the questionnaires. It is also possible that the social and educational status of the participants and the filling in of the questionnaire by the researcher due to the illiteracy of many participants can affect their answers. This relatively high rate of medication adherence in caregivers of children with epilepsy in Hormozgan province may be due to the adequate and appropriate patient education, counseling, and follow-up provided by healthcare providers. It is interesting to note that almost all caregivers were aware of the names of their children's antiepileptic drugs and also the time since the last seizure attack. Although, since more than half of the participants have mentioned, that the last 3 months have passed from the child's last seizure (relative control), this rate of medication adherence does not seem far-fetched. In our study, the median score of medication adherence was higher in female caregivers than in men. However, the researchers in the previous study did not report a significant relationship between patients' gender and medication adherence score [34]. There are many reasons why men and women adhere to medication differently. These reasons include factors like age, sex, income, the specific disease, the type of treatment, and mental health. We need more research to understand these differences better. This will help us create personalized treatment plans for men and women to improve medication adherence and reduce the impact of chronic diseases.

In the present study, the mean score of beliefs about medicines in caregivers of children aged 10 to 19 years was significantly lower than in caregivers of children aged 2 months to 9 years. In previous studies, the relationship between caregivers' belief scores and children's age has not been reported. However, some of them who evaluated medication adherence in children with epilepsy reported an inverse relationship between children's age and medication adherence. This means that the treatment compliance score was better in younger children [12, 34-36]. In our study, the mean score of beliefs about medications in caregivers whose time since the child's last seizure was more than 3 months was significantly higher than those whose child had a seizure in the last 3 months. This finding is not consistent with the results of the previous study. They found that patients who reported no seizures in the past year had more specific negative beliefs about medications compared to patients who reported one or more seizures in the past year [32]. Since drug beliefs may be different in different cultural groups, [37] this discrepancy may be due to the different cultural backgrounds in the participants of the two studies.

Limitation

One of the limitations of this study was the COVID-19 pandemic affecting the sampling time, which led to limitations in referring patients to the clinic for follow-up. Another limitation of this study was measuring adherence using a self-report questionnaire, which may not be as accurate as direct measurement. The design of the current study was cross-sectional, and therefore could not evaluate the cause-effect relationship between the study variables. As a suggestion for future studies, these variables can be evaluated using a prospective longitudinal design.

CONCLUSION

This study did not indicate a significant relationship between medication adherence and the belief score about the necessity of antiepileptic medication and the concern about its side effects in children and adolescents with epilepsy. However, the medication adherence score was high. This desirable result refers to appropriate education to caregivers of these children by health providers, especially nurses, about the positive effects of medication adherence and the negative effects of non-use or irregular use of antiepileptic drugs. The

results of this study highlighted the importance of the education role of nurses in increasing the medication adherence of children and adolescents with epilepsy.

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AUTHORS' CONTRIBUTIONS

FE and MH: Conception and design of the study, Manuscript writing, Critical revision. ShB and SB: Data collection ShR: data analysis and interpretation. MH: Critical revision of the article for important intellectual content.

ETHICAL CONSIDERATION

The present study was approved by the Ethics Committee Shahid Beheshti University of Medical Sciences, (IR.SBMU.RETECH.REC.1400.1097). The ethical guidelines of the Declaration of Helsinki were also observed.

CONFLICT OF INTEREST

We have no conflict of interest to declare.

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