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Assessment of Community-Based Home Health Programs among Children with Chronic Disease in Tertiary Care Center, Riyadh

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ABSTRACT

Background: *Home health care (HHC) is a newly developed model of care that helps patients to be treated at their home and avoid hospital admission with the aim of promoting, maintaining or restoring health as part of their comprehensive services.* ***Objective:*** *To assess the effectiveness of HHC in reducing the days of admissions and ED visits for children with chronic diseases.* ***Materials and methods:*** *A cross-sectional study held at a tertiary care center. Consecutive sampling technique was used to review all patients' files registered for HHC program from 2016 to 2018. Continuous variables were reported as mean and standard deviation, whereas categorical were reported as percentages and frequencies. Wilcoxon rank test was used to assess differences before and after enrolment in the HHC program. SPSS V22.0 was used for analysis.* ***Results:*** *A total of 92 patients were involved in this study; 57% were males and 44% were females. 42% of them had neurodevelopmental diseases. Among all the services provided, nursing care was the most needed service. The total number of days of admission was reduced from 28 ± 0.6 to 6.75 ± 0.39 days in 4 months period and from 38.37 ± 62 to 9.02 ± 14 days in 6 months period with p-value<0.001. However, the ED visits were not affected by the p-value of 0.19 and 0.33 for both 4 months and 6 months period, respectively.* ***Conclusion:*** *HHC program showed an effective result in reducing the frequency of hospital admission and days of children's admission, yet it had no effect on lowering the ED visits.*

Keywords: Community based care, Chronic diseases, Home healthcare, Program, Paediatrics

Key Messages: HHC programs are effective in reducing the burden of inpatient hospital care for children with chronic diseases needing continuous health care support

INTRODUCTION

Chronic diseases in children are defined as a health problem that happened to children aged from birth up to 18 years old which is not yet curable or considered as resistant to treatment that lasts for more than three months [1]. It affects the children's normal activates by demanding medical care, home health care and many admissions [1]. Chronic conditions can affect the children from many different aspects including physical, emotional, or mental aspects so that

it prevents them from doing their normal activities, attending school or doing their work [2]. In addition, it demands frequent doctor visits and regular use of medications, or sometimes it requires the use of special equipment [2].

Many previous epidemiological studies conducted in the United States show that 1 out of 4 children aged 17 years and younger suffer from different types of chronic conditions account for 15 to 18 million children [2]. In Saudi Arabia, the prevalence of specific diseases and conditions that are considered to be common chronic conditions ranges widely. For example, in a study conducted in the period from 1999 to 2008, childhood cancer accounted for about 8% among all the cases [3]. Among that, the most common cancers were leukemia (34.1%), lymphoma (15.2%), brain (12.4%), and kidney cancers (5.3%) [3]. The prevalence of type 1 DM children and adolescents is 109.5 per 100,000 [4]. The prevalence of asthma in children over the past three decades has been reported to range from 8% to 25% [5]. Out of 45,682 children and adolescents, 108 of them had sickle cell disease [6].

It is important to highlight the fact that chronic condition among those children is very costly and effort consumer in a way that it demands a lot of hospital admissions and emergency department (ED) visits. In a study conducted in the United States, the majority of children's days of admission and costs were due to chronic illnesses [7]. Moreover, it was documented that the overall annual ED visit rate account for 569 per 1000 [8]. As the number of children's chronic conditions increased from 0 to more than 3.9, the visit rates also increased. Among the highest ED visit rates for those with chronic conditions were related to sickle cell anemia, epilepsy, and asthma [8]. One of the examples in accordance with NHAMCS-ED data, those children who are younger than 18 known to have asthma visited the emergency department (ED) about 628,759 visits in 2010. The average cost per visit was estimated to be $433, it costs a total of $272,453,850 in 2010 [9].

As hospitalization costs much higher for the payers, alternatives solutions are required. Home health care (HHC) is a newly developed model of care that helps to decrease the number of hospital admission by providing the critical elements of hospital care to home [10]. The team of HHC is commonly composed of physicians or nurse practitioners with the aim of promoting, maintaining or restoring health as part of their comprehensive services [11]. In one study conducted in Singapore, it shows that adult patients enrolled in the HHC program had significantly decreased acute hospital utilization by lowering the ED visits and hospital admissions [12]. However, the effectiveness of these HHC programs in reducing acute hospital utilization in children is not yet assessed, and there is a need for careful studies to assess its effectiveness.

HHC program at King Abdullah Specialist Children Hospital was established in 2016 with the aim of enabling more patients to be cared for at home by qualified and skilled staff and reduce the hospital load. It maintains the sickest patients within the highest quality of multidisciplinary services with available resources. HHC provides them with many services include medical, nursing, respiratory, occupational therapy, clinical nutrition, and social work.

The study aimed at assessing the effectiveness of the HHC program in terms of reducing the number of inpatient admission and the number of emergency department visits for children with chronic diseases.

SUBJECTS AND METHODS

A cross-sectional study was conducted by reviewing charts children with chronic diseases registered under the home health program at King Abdullah Specialist Children Hospital, a tertiary care hospital in Riyadh, Saudi Arabia. Consecutive sampling technique was used and all the patients' files from 2016 to 2018 were included in the study. The data were extracted using the electronic records of the patients available from the BESTCare Hospital Information system. This study included all children aged 1-15 years, both genders from all nationalities with chronic diseases. However, those who were registered for minor procedures like overnight pulse oximetry, intravenous (IV) medication were excluded. Additionally, the children who died after enrolment into the program between "2016-2018" were also excluded from the study. After applying the inclusion and the exclusion criteria, a total of 92 children files were reviewed.

The data collected from the patients' files included sociodemographic, patients' conditions, types of services provided, frequency of visit by HHC team, frequency of Emergency Department (ED) visits, frequency of admission, and total days of stay in hospital before and after joining the program. The patient's conditions were further classified into genetics, congenital, neurodevelopmental, pulmonary, autoimmune, immunodeficiency and trauma. The data was initially entered in Microsoft Excel™ and later exported to Statistical Package for Social Sciences IBM® SPSS® Statistics V22.0 for analysis. The initial frequencies were run, and data checked and cleaned before analysis. The descriptive statistics were reported in a tabular form and the continuous variables were reported as mean and standard

deviation whereas categorical variables were presented as percentages and frequencies. For measuring the differences before and after enrolment into the HHC program Wilcoxon rank-test was used. Non-parametric testing was performed because of high variation and non-normal distribution. The p-value of <0.05 was considered significant for all the tests applied.

Ethical approval for this study (reference no. IRBC/1737/18) was obtained from the Institutional Review Board of King Abdullah International Medical Research Centre's (KAIMRC), Riyadh, Saudi Arabia.

RESULTS

Overall, a total of 92 children were included as per the inclusion criteria. Out of those 92, 52 (57%) were males and 40 (44%) were females with a mean age of 5 ± 5 years, and most of the children were between age 4-6 years.

The mean BMI was 16.9 ± 6.8, and most of the patients were underweight n (75%). Regarding the patients' conditions, the three most common reasons for enrolment in the HHC were neurodevelopmental diseases (42%) followed by genetic, autoimmune (19%) and (14%), respectively.

From all services provided by the program, nursing care was the most needed from all of the patients with a percentage of 79 (79%). In addition to nurses, respiratory therapy was the second most common service provided to the children at home with a percentage of (44%) Other services provided by the team included: dietitian, social work and lab work (41%, 23%, and 8%), respectively (Table 1).

Table 1 Demographic profile and patient details enrolled in home healthcare program (n=92)

Variables	**Mean ± SD**	
Age (years)	7 ± 5	
Age of visit	5 ± 5	
BMI	16.9 ± 6.8	
Variables	**Categories**	**Frequency (%)**
Age categories	Up to 3 years	24 (26%)
	4-6 years	26 (28%)
	7-11 years	22 (24%)
	>11 years	20 (22%)
Gender	Male	52 (57%)
	Female	40 (44%)
BMI Categories	Underweight	69 (75%)
	Normal	18 (20%)
	Overweight	2 (2%)
	Obese	3 (3%)
Underlying conditions	Genetic	17 (19%)
	Congenital	7 (8%)
	Developmental and Neurological	39 (42%)
	Pulmonary	9 (10%)
	Autoimmune	13 (14%)
	Immunodeficiency	3 (3%)
	Trauma	9 (10%)
Year joining the program	2016	29 (32%)
	2017	44 (48%)
	2018	19 (21%)
Services provided to the patients at home	Respiratory therapy	40 (44%)
	Physiatry	40 (44%)
	Dietitian	38 (41%)
	Lab work	7 (8%)
	Social work	21 (23%)
	Nurse	73 (79%)

The total number of days of hospital admissions for all the patients in the study, irrespective of their disease or age status was decreased from 2632 to 621 at 4 months period and from 3530 to 830 at 6 months period before and after

enrolment into the program. However, the total number of admissions was not affected much. The number of admissions done at 4 months decreased slightly from 112 to 100, whereas at 6 months it increased from 125 to 130 admissions (Figure 1).

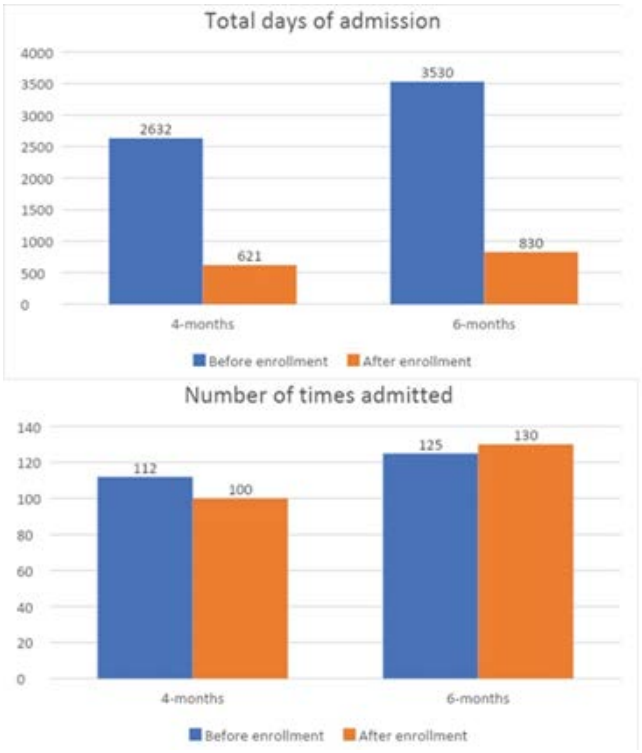

Figure 1 Hospital admission before and after enrolment into HHC

The mean number of times admitted at 4 months prior to enrolment was 1.22 ± 1.2 vs. 1.09 ± 1.4 post-enrolment. While the mean number of times admitted at the 6-months period; 1.36 ± 1.4 pre-enrolment admissions vs. 1.41 ± 1.8 post-enrollment admissions (p=0.89). There was a significant decrease in the total days of admission after enrolment into the HHC program. The average number of days of admission per patient was 28 ± 0.6 at 4 months before enrolment which was reduced to 6.75 ± 0.39 days after enrolment with (p<0.001). This effect was also seen at 6 months period for the total days of admission before enrolment which was reduced to 9.02 ± 14 days after enrolment (p<0.001). The mean numbers of ED visit 4 months prior to enrolment was 1.85 ± 1.8 compared to 2.18 ± 2.3 visits in the post-enrolment period. The mean numbers of ED visit 6 months prior to enrolment was 2.48 ± 2.6 compared to 2.88 ± 2.9 visits in the post-enrollment period (Table 2).

Table 2 Pre-post enrolment hospital utilization, at 4 months and 6 months visits per person (n=92)

Emergency department visits	Total events for all patients		Mean events per person		Difference (before-after)[a]		p-value
	Before	After	Before	After	Total	Mean	
4-months	170	201	1.85 ± 1.8	2.18 ± 2.3	31	0.3	0.19
6-months	228	265	2.48 ± 2.6	2.88 ± 2.9	37	0.4	0.33
Number of times admitted							
4-months	112	100	1.22 ± 1.2	1.09 ± 1.4	12	0.1	0.15
6-months	125	130	1.36 ± 1.4	1.41 ± 1.8	5	0	0.89
Days of admission							
4-months	2632	621	28.61 ± 47	6.75 ± 10	2011	21.9	<0.001*
6-months	3530	830	38.37 ± 62	9.02 ± 14	2700	29.4	<0.001*

[a]Negative difference shows increase utilization; *Wilcoxon rank test significant at 0.05

DISCUSSION

In this study, a total of 92 children with different chronic diseases were included at HHC at tertiary care hospitals. Among all services provided by HHC, nursing care was the most needed service provided to the children at their homes. This multidisciplinary team approach showed an effective result in reducing the days of patients' admission at four and six months before and after the program enrolment.

The results of our study showed a significant decrease in the number of admissions which are similar to another study conducted by Melissa, et al., the results showed that patients who had been enrolled to home health program had significantly lower days of hospitalization post-program enrolment [13]. Reducing the number of days of the patient being admitted will help significantly in reducing the costs that are needed for the patients with comorbidities as they are considered to be high utilizers of hospital resources. WHO reported the cost of hospital stay per day in a tertiary care hospital in Saudi Arabia is around $170 [14]. Thus HHC program is effectively reducing the burden of hospital admissions and in turn reducing the financial burden as well.

Moreover, there was a little reduction in patients' number of admissions after joining the program in both 4 and 6 months. Similarly, in a study that was conducted on patients with congestive heart failure, HHC showed its effectiveness in reducing the number of readmissions from 63 to 36 with p-value=0.03 [15]. A study conducted among of 2783 hospitalized children HHC services, showed that the rate of readmission was lower at 30 days by 18.3% [16]. Another study reported a similar finding with a percentage of reduction of around 52% [12].

The number of ED visits showed no reduction between 4 and 6 months before and after the program enrolment. The increase in ED visits post-enrollment was not surprising. It could be correlated to the discovery of unresolved clinical issues or diagnosis of new conditions that require specialist input. Just like our finding, a study reported that the ED rate of visits has increased in patients in the HHC program especially on the same day of the HHC visits [15]. On the other hand, Hsien, et al., concluded their study in that HHC in end-of-life nursing helped to reduce the rate of ED visits [17]. Furthermore, in a cross-sectional study that was distributed among emergency physicians, 90% of them reported that HHC help in reducing unnecessary hospitalizations and observation stays [18].

Even though we obtained significant findings that help in understanding the role of HHC, there were several limitations. First, our study was conducted only in one tertiary care center. Secondly, this study included a low number of patients since this is a newly developed program started in 2016, with only a few children met our inclusion criteria and it is limited to the pediatric population without the inclusion of adults.

CONCLUSION

Our research clearly shows the great benefits of HHC in terms of reducing the frequency and the total days of children's admission of hospital after the program enrolment in both 4 and 6 months period. However, ED visits were not reduced due to the discovery of unresolved clinical issues. The multidisciplinary HHC services showed to be cost-effective by lowering the utilization of hospital resources. Further researches regarding the quality of life and clinical outcome are needed.

DECLARATIONS

Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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