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Effect of Rotavirus Education Program on Knowledge and Attitudes of Mothers Attending Family Center-Cairo

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Abstract: Rotavirus is the most common and important cause of diarrhea in infants and young children worldwide. The rotavirus vaccine has not been included in the Egyptian National Immunization Program. This study **aimed** to evaluate the effect of rotavirus education program on knowledge and attitudes of mothers attending family center in Cairo. A quasi- experimental **design** was used. The study was conducted at Dar-Al-salaam **family health center** in Cairo governorate. A purposive **sample** of 56 mothers of children under five years old were included in the study. Two **tools** were used for data collection: 1) mothers' interviewing a structured questionnaire which included five parts: demographic characteristics; socio-economic data; family history of rotavirus disease; home environmental assessment; and Mothers' knowledge about rotavirus diarrhea and vaccines. 2) Mothers attitude Likert scale regarding rotavirus diarrhea and vaccine. The study results revealed a highly statistically significant positive correlation between the mothers' total knowledge scores and total attitudes scores and the family income. Conclusion, there was a highly statistically significant difference between mothers' total knowledge scores and total attitudes scores in pre and post program implementation. An ongoing rotavirus education programs are recommended to mothers at family health centers that will consequently enhance mothers' knowledge, have a positive effect on treatment of rotavirus diarrhea and improve the health status of their children in the community.

Keywords: Rotavirus, Educational Program, Knowledge, Attitude and Mothers.

Introduction

Rotavirus (RV) is the most frequent cause of severe gastroenteritis in infants and young children worldwide (Troeger, Blacker, Khalil, Rao, Cao, Zimsen & Reine, 2018). RV causes severe diarrhea, vomiting, and fever and mostly affects newborns and young children. Diarrhea and vomiting can lead to severe dehydration. If dehydration is not treated, it can be fatal (Anigilaje, 2018). Children with this disease can quickly pass it on to other children, and rarely to adults. Once a child is infected with the virus, the illness takes about two days. Vomiting and diarrhea can last for three to eight days and can lead to a loss of body fluids, which can lead to dehydration. This presents a significant risk, especially for newborns and young children (Burnett, Parashar, & Tate, 2018).

Rotavirus diarrhea (RVD) continues to be a serious public health issue in developing countries. RVD can be found anywhere in the world, it is most common in preschool-age or younger children in East and Southeast Asia, particularly Egypt (Ibrahim et al., 2015). In this regard, Banyai, Estes, Martella, & Parashar, (2018) reported that children are most likely to contract the disease despite showing milder symptoms than adults due to their close contact with the home environment.

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As reported by the Centers for Disease Control and Prevention (CDC) (2018), RVD is a significant cause of mortality and morbidity in children under the age of five. RVD is responsible for at least 500,000 child deaths annually, with the vast majority of these deaths taking place in underdeveloped nations. It is responsible for 33%–44% of all episodes of diarrhea in children under the age of five in Egypt. WHO (2011) has acknowledged and recommended the need for an effective vaccine against the disease given the high disease burden in both developed and developing countries.

The rotavirus vaccine (RVV) prevents a severe infectious disease, lowers hospitalization and economic costs, and decreases mortality. The effective RVV significantly reduces the incidence of severe diarrheal disease. Monovalent and pentavalent oral live attenuated vaccines against human rotavirus have been accepted in numerous countries (Yen, Healy, Tate, Parashar, Bines, Neuzil, & Steele, 2016). RVV have been recommended for inclusion in routine immunization programs all over the world by the World Health Organization (2018). Despite the high prevalence of severe rotavirus-associated diarrhea in these areas, the vaccines have only recently begun to be included in the national immunization programs of countries in Asia and only to a limited extent in Africa.

Rotavirus vaccine is still underutilized in infants despite the availability of safe and efficacious vaccinations, which contrasts with the observed immunization coverage rates with the majority of primary childhood vaccines, which have remained constant and high. In high- and low-income environments, there are similar causes of underutilization. Parents frequently believe that maintaining better hygiene and cleanliness would effectively eliminate incidences of RVD (Crawford, Ramani, Tate, Parashar, Svensson, Hagbom, & Estes, 2017). It is important to remember that mothers' negative sentiments about rotavirus diarrhea and its vaccine reduce the likelihood that a child will receive a vaccination. Researchers studying mothers' knowledge and attitudes toward rotavirus diarrhea and its vaccine have divergent views on the impact of mothers' decisions on children's vaccination status. Negative attitudes of parents and toward rotavirus diarrhea and its vaccine have been identified as a barrier to children’s rotavirus vaccination (Gellin et al., 2017).

The Community Health Nurse (CHN) plays a critical role in improving the health status of communities by serving as the primary health informant for mothers, assessing the health needs of children, assessing the knowledge and attitudes of their mothers towards their care and protection, particularly from communicable and endemic diseases such as rotavirus, and delivering health education programs to guide mothers in protecting and caring for their children (Stanhope & Lancaster, 2018).

Significance of the study

Rotavirus epidemiology has been the subject of numerous studies in Egypt. According to a study conducted by Seliem, Sultan, & Gouda, (2014), the incidence of rotavirus diarrhea was approximately 10-100/100000 cases of RVD per year among hospitalized children under five in Cairo, Egypt. Another study by Allayeh, ElBaz, Saeed, and Osman (2018) at Abu El-Reesh hospital in Cairo, Egypt, discovered that 30 deaths per 100,000 Egyptian children under five years of age occur annually as a result of diarrhea.

Rotavirus diarrhea is transferred by the fecal-oral route, through contact with infected hands, surfaces, and objects. More than 10 trillion infectious particles can be found in one gramme of infected feces, of which only 10–100 is necessary to spread infection to another person (Mayanskii, Mayanskii, & Kulichenko, 2015). Immunization forms one of the most significant and affordable strategies for preventing childhood illnesses and disorders and is thus a basic need for all children. Children in Egypt are still losing their lives to diseases that can be prevented with vaccines, healthy practices and safe drinking water, such as rotavirus diarrhea, which is still the second leading cause of death among children, after respiratory infections.

In Egypt, the rotavirus vaccine is recommended but is not publicly funded; therefore, vaccine uptake depends largely upon whether healthcare providers recommend it to parents and its affordability. So, the mother has an important building role in the hygienic awareness and food habits among children inside the family, so the mother should have better knowledge and attitudes toward the prevention of rotavirus diarrhea by vaccine among children (Shaheen, 2019).

Prevention is essential for controlling diarrheal infections caused by rotavirus and reducing diarrhea-related mortality and morbidity. WHO (2013) and UNICEF (2019) have come up with general and specific preventive measures to avoid RVD. General preventive measures include access to safe drinking water (e.g., water safety planning, water management from source to tap, home water treatment, safe storage); improved sanitation facilities; and hand washing with soap at critical times, such as after using the restroom and before food preparation. Hygiene promotion, along with access to clean drinking water and adequate sanitation, must be within everyone's reach. As for specific preventive measures, both have recently recommended RVV as an essential agent for the prevention of RVD in children.

The community health nurse plays a crucial role in assessing, planning, developing, organizing, and applying strategies for preserving a high level of knowledge and supportive attitudes toward mothers and their children (Clement, 2012). CHNs, as health professionals and members of groups and communities, are expected to actively participate in identifying needs and initiating action to develop programs which promote the health of children (WHO, 2017). Since the rotavirus vaccine has not yet been included in the national immunization program in Egypt and parents provide vaccines for their infants by their own means, the CHN should assess and educate mothers about rotavirus diarrhea and the rotavirus vaccine. Therefore, the aim of this study was to evaluate the effect of a rotavirus education program on knowledge and attitudes of mothers towards prevention of rotavirus diarrhea in Cairo governorate.

Aim of the Study

This study aimed to evaluate the effect of rotavirus education program on knowledge and attitudes of mothers attending family center in Cairo.

Subjects and methods

Research hypotheses

To fulfill the aim of this study, the following research hypotheses were formulated:

H.1: Mothers will have higher knowledge scores regarding rotavirus diarrhea after implementation of the program.
H.2: Mothers will have higher knowledge scores regarding rotavirus vaccine after implementation of the program.
H.3: Mothers will have positive attitudes scores regarding rotavirus diarrhea after implementation of the program.
H.4: Mothers will have positive attitudes scores regarding rotavirus vaccine after implementation of the program.

Study design

A quasi-experimental research design (pre/post-test) was utilized to achieve the aim of the current study. An educational program was developed, constructed, and applied with an approach of pre-test and post-test for the studied mothers.

Setting

The study was conducted at Dar Al Salam Family Health Center in the Cairo Governorate. It is a primary health care center that provides individual and family health care at all ages and for both sexes. It also provides initial consultations for all diseases. It was established to offer the activities of primary health care and family medicine to serve the people of this region. The center has a family medical filing system that helps researchers select a study sample. The center consists of two floors. The first floor consists of an outpatient clinic for children, a vaccination clinic, a waiting area for mothers, a pregnancy clinic, a family health clinic, and a dental clinic, while the second floor consists of an investigation lab, a consulting clinic, a sterilization room, and a dental laboratory. The center operates throughout the week and serves the surrounding population areas. It provides services in all medical fields to be a center for immunization and a source for vaccines. Through the clinical observation of the researchers, they found an increase in the number of customers visiting the center, especially children under the age of five and mothers.

Sample and sampling technique

A purposive sample of 56 mothers who had children aged less than 5 years of age and who attended the vaccination clinic during the time of the study and who agreed to participate were included in the study.

Tools of data collection

The researchers developed two tools after reviewing recent national and international Arabic and English related literature using textbooks, articles, scientific journals, and the internet

to collect the study data as follows: Tool I: mothers' interviewing: a structured questionnaire including five parts; Part 1: Demographic characteristics (age, education level, occupation, marital status, residence, family income).

Part 2: El-Gilany et al. (2015) developed the socioeconomic status scale (SES) to assess the socioeconomic status of the Egyptian family. It was tested for validity & reliability, the total SES scores of 84 points were assessed on a continuum and divided into 4 socioeconomic status levels: very low socioeconomic status (scoring less than 21 points), low level from (22 - 42), middle level from (43-63), and high levels from (64-84).

Part 3: Family history of rotavirus disease. Part 4: Home Environmental Assessment collects data about the indoor and outdoor environment such as (water supply, meal preparation, and waste removal) within and outside the house. Part 5: Mothers' knowledge of rotavirus diarrhea included 2 sections, section 1 contained information on the nature of the illness, methods of transmission, the typical age group affected, and risk factors for rotavirus diarrhea; food safety-related queries, such as whether foods kept in refrigerators have been washed and cleaned; how to clean fruits and vegetables; how to clean kitchen equipment between various sorts of food; etc. Questions related to personal hygiene, such as hand washing after coming home, washing hands regularly before, after toileting, before food preparation, before and after eating, etc. Section 2: Mothers' knowledge related to rotavirus vaccine It includes questions such as: Do you know that there is a vaccination for rotavirus? Do you know when the right time is to give the rotavirus vaccine? etc.

A total knowledge score was calculated by allocating a score of 2 for the correct answers and a score of 1 for the incorrect ones. The total knowledge score was converted to 100% and then divided into three categories: good knowledge with 75% or more, fair knowledge with 60% to less than 75%, and poor knowledge, with less than 60% being considered poor knowledge (Greasley, 2007).

Tool II: Mothers attitude Likert scale regarding rotavirus diarrhea and vaccine, it included 56 questions and mother’s responses were categorized into either agree, somewhat agree, and disagree. This tool is classified into two parts to assess: Section 1: Mothers attitudes regarding rotavirus diarrhea, it included questions such as (rotavirus is a serious disease, and rotavirus diarrhea is a curable disease, etc…). Section 2: Mothers attitudes regarding rotavirus vaccine, it includes questions such as rotavirus vaccinations is safe vaccine and rotavirus vaccines has more benefits than harms, etc… Scoring system: Tool categorized into either agree, somewhat agree, and disagree. Scores of agree, somewhat agree and disagree, agree was scored (2), somewhat agree was scored (1) and disagree was scored (0) then a total score is calculated. Positive and negative attitudes were determined by converting the overall attitude score to 100%, with scores greater than or equal 75% being classified as positive attitudes and scores less than 75% as negative attitudes (Greasley, 2007).

Content validity and reliability

Content validity for the developed tools was created by 3 panels of professionals in the fields of pediatric health nursing and community health nursing, two professors in community health nursing and one expert in pediatric health nursing. Each of the experts on the panel was asked

to examine the tool for content, clarity, wording, format, and overall appearance. No modifications to the tools were made after the conduction of the pilot study on 10% of the sample to test the clarity of the question and the content of the tools. Cronbach's Alpha was used to evaluate the tools' reliability; it was 0.95, and 0.92, respectively.

Ethical considerations

An official approval was obtained from the Research Ethics Committee to conduct the proposed study. Then official approval was obtained from the family health center administrator and a formal written consent was obtained from the mothers after informing them of the purpose and nature of the study. Participation in this study is entirely voluntary; each participant has the option to accept or decline participation in the study. After carefully reading the informed consent form, the study participants signed it; the ethical considerations included explaining the goal and scope of the study; anonymity and confidentiality were ensured through data coding. Participants had the right to withdraw from the study at any time, and the information gathered was only used for this particular purpose.

Procedure

To fulfil the aim of the current study, the following steps were followed before conducting the study; the researchers made an initial visit to the family health center to become acquainted with the filing system and the flow of clients. Then, formal written approval was obtained from the faculty of nursing at Cairo University and the director of the selected family health center to select mothers. The researchers communicated with the head nurse of the vaccination clinic to clarify the study's aim and nature. The head nurse introduced the researchers to the clinic staff. Following that, the researchers invited the mothers to participate in the study on a voluntary basis. The researchers clarified the study's purpose and nature, then outlined the rights of the mothers to accept or refuse participation in the study. Confidentiality of their data was assured through coding. A written informed consent was obtained from every mother who consented to participate in this study. The study tools were completed by each mother herself. As for the mother, who cannot read or write, the researcher conducted an interview with her to complete the study tools. The time taken to complete the tools was 15 to 20 minutes. Data was collected for three (3) months, two (2) days per week.

The rotavirus education program was carried out in the following four phases:

1. In the assessment phase, the researchers assessed mothers' attitudes and knowledge of rotavirus diarrhea and the vaccine using the pre-mentioned tool.

2. In the planning phase: In this phase, the researchers established the rotavirus education program based on the assessment findings and an extensive review of prior and present regional and global related books, publications, and journals. This program aimed to enhance the mothers' attitudes and knowledge of rotavirus diarrhea and its vaccine. The content of the health education program included goals and objectives, simple and clear information about rotavirus diarrhea and its modes of transmission; signs, symptoms, management, complications, and prevention; caring for children with watery diarrhea; rotavirus vaccine; its importance for

infants; timetable, doses, routes of administration, and the places where the vaccine is available; side effects; and contraindication guidelines for mothers in caring for the child after administering the vaccine.

3. Implementation phase: Implementation of the program was carried out at the previously mentioned setting. At the beginning of the first session, an orientation to the program and its aim was presented. Each session began with a summary of what had been covered in previous sessions and an explanation of the goals of the new topics, taking into account the level of mothers and using straightforward language. The rotavirus education program was consisted of eight monthly sessions. Mothers and their children were divided into subgroups. The limit number of mothers and their children was ten in the session. For a month, each group attended two sessions per week. Each session lasted for 30 to 45 minutes in the vaccine clinic waiting area at the family Center, followed by 15 minutes of reviewing key points and discussing any questions for mothers. A variety of tools were employed, including data show, posters, brochures, videos, and counselling techniques. The mothers received a booklet with the key points to be used as a reference following the program's implementation.

4. Evaluation phase: Following the program's implementation, the researchers evaluated the mothers' knowledge and attitudes to determine whether they had acquired new knowledge and whether their attitudes had changed using the same study tools.

Statistical analysis

Using the "statistical package for the social sciences" (SPSS windows) version 26, the data were coded, scored, tabulated, and analyzed by computer. Relations between different numerical variables were tested using Pearson correlation. A probability (p-value) of less than 0.05 was considered significant.

Results

This study was conducted to evaluate the effect of rotavirus education program on knowledge and attitudes of mothers attending family center in Cairo. Fifty-six mothers with their children who attended vaccination clinic were included in the study.

Table 1 reveals that 46.4% of the mothers aged from 25 <30 years old had a mean age of 34.64 ± 4.24 years old. Regarding mothers' education, the results revealed that 50.0% had a secondary education. Regarding marital status, 92.9% of mothers were married, while 7.1% were divorced. The results also revealed that 78.6% of mothers were housewives. Concerning place of residence, 50% of the mothers were from urban areas, and the rest were from slum areas. Regarding the number of family members in the house, it was found that 75% of mothers had more than 4 members in their family.

Table 2 indicates that 100% of the mothers reported that their children under 5 years of age had acute watery diarrhea, and 96.4% of the affected children had diarrhea and gastroenteritis on a regular basis. The table also shows that 50% of the mothers go to the hospital for treatment when their children suffer from diarrhea and gastroenteritis, while the other 50% report that they give medication at home.

Figure 1 illustrates that 54% of the mothers had low socioeconomic status, while 46% of them had middle socioeconomic status.

Figure 2 shows that 10.7 % of the mothers had a good level of knowledge regarding rotavirus diarrhea pre-implementation of the program compared to 78.6% post-implementation. This figure covered the first research hypothesis.

Figure 3 clarifies that only 3.6 % of the mothers had a good level of knowledge regarding rotavirus vaccines pre-implementation of the program, which increased to 96.4% post-implementation. This figure covered the second research hypothesis.

Figure 4 reveals that 17.9 % of the mothers had positive attitudes regarding rotavirus diarrhea pre-implementation of the program compared to 71.4% post-implementation. This figure covered the third research hypothesis.

As observed in Figure 5, none of the mothers had positive attitudes regarding the rotavirus vaccine pre-implementation of the program compared to 89.3% post-implementation. This figure covered fourth research hypothesis.

Table 3 reveals a statistically significant negative association between mothers' total attitudes scores and place of residence (P =.029*). Furthermore, a statistically significant positive correlation was found between fathers' and mothers' educational level and their total attitudes scores (P = 0.040* and P = 0.028*) respectively. A highly statistically significant negative correlation was found between the total family members and total knowledge scores (P =.002**). The table also reflects a highly statistically significant positive correlation between the mothers' total attitudes scores and the family income (P = 0.00**). Also, a statistically significant positive correlation was found between the mothers' total knowledge scores and the family income (P = 0.024*).

Table 4 indicates that a highly statistically significant positive correlation was found between mothers' total socioeconomic characteristics and their total attitudes scores (P = 0.000).

Table 5 shows that a highly statistically significant difference was found pre and post the program. There was a highly significant difference in mothers' total knowledge and total attitude scores about Rota diarrhea and its vaccine (P = 0.000). In the posttest, the mothers' total knowledge and attitude were higher than in the pretest. This table covered the first, second, third, and fourth research hypotheses.

Part I: Description of socio-economic and demographic characteristics of the study sample (Tables 1,2 & figure 1).

Table 1: Frequency and Percentage Distribution of Socio-Demographic Characteristics of the Study Sample (n=56)

Variables	n = 56	
	No.	%
Mother's Age:		
25 <30	26	46.4
30 <35	16	28.6
35 <40	10	17.9
≥40	4	7.1
X ± SD	34.64± 4.24 years	
Marital Status:		
Married	52	92.9
Divorced	4	7.1
Mother's Education		
Cannot read and write	6	10.7
Read and write	8	14.3
Preparatory Education	8	14.3
Secondary Education	28	50.0
University Education	6	10.7
Mothers Occupation:		
Not work/ Housewife	44	78.6
Professional work	2	3.6
Crafts	4	7.1
Free business	6	10.7
Place of residence:		
Urban	28	50.0
Slum area	28	50.0
Number of family members:		
Less than 5	14	25.0
5 and more	42	75.0
Total	56	100.0

Table 2: Frequency and Percentage Distributions of the Study Sample Regarding Family Past Medical History of diarrhea (n= 56).

Variables	n = 56	
	No.	%
Has any of your children had acute watery diarrhea:		
Yes	56	100.0
Is the affected child (<5 years) frequently suffering from diarrhea and gastroenteritis		
No	2	3.6
Yes	54	96.4
What actions did you take with affected child		
Go to the doctor	28	50.0
Giving some treatment at home without doctor	28	50.0

Total	56	100.0

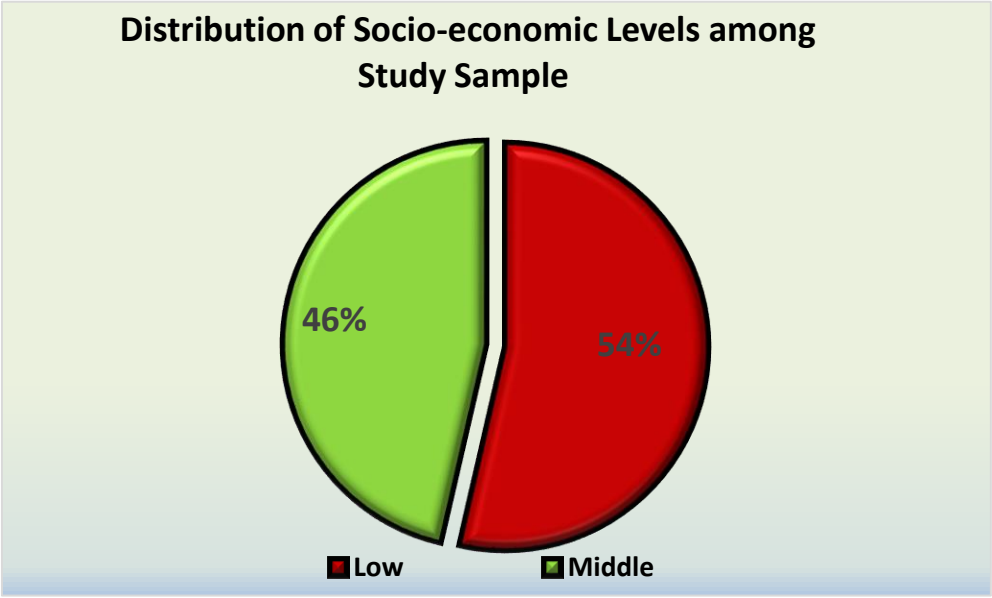

Figure 1: Percentage Distribution of Socio-economic Levels among Study Sample (n = 56)

Part II: Mothers Knowledge related to rotavirus diarrhea and vaccines in pre and post-test (Figures 2 & 3).

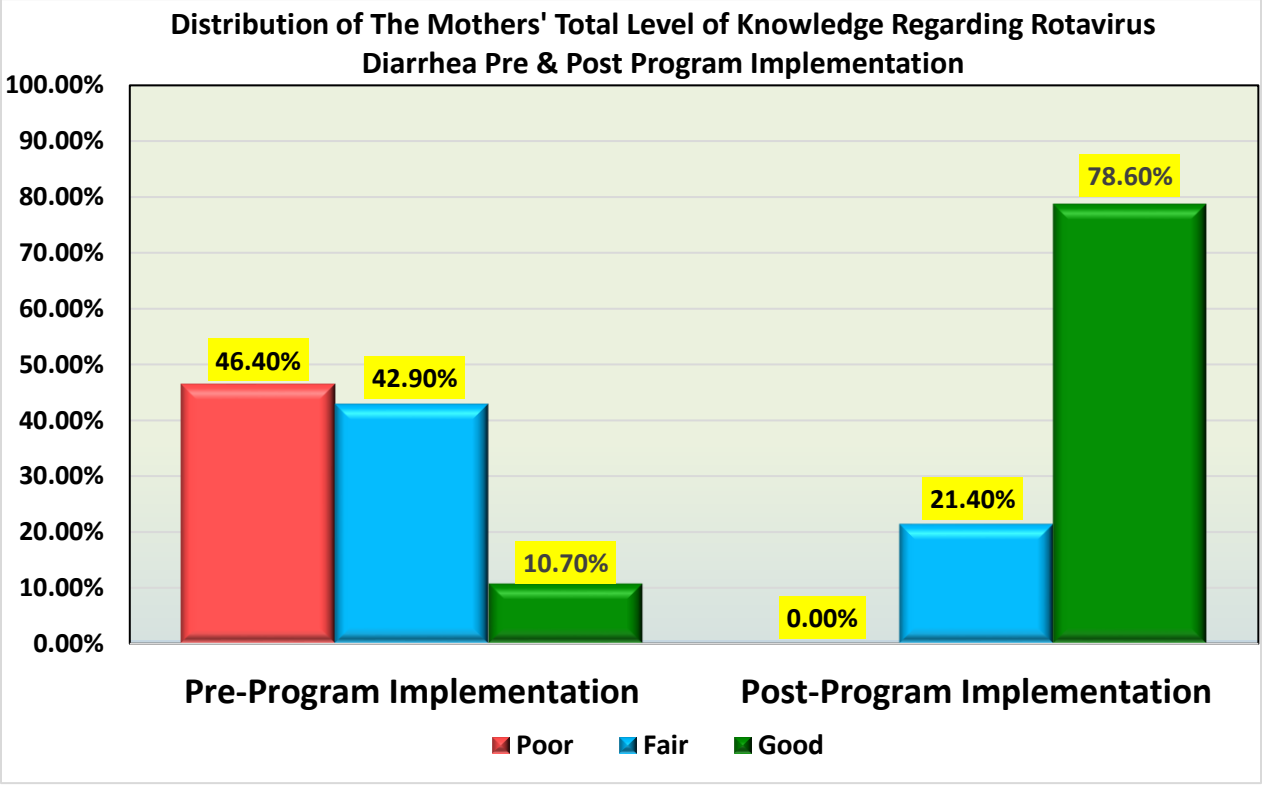

Figure (2) Distributions of mothers' total knowledge scores regarding rotavirus diarrhea (n= 56).
Poor level of knowledge= <60% of total score, Fair level of knowledge= 60% to 75% of total score, good knowledge= more than 75% of total knowledge

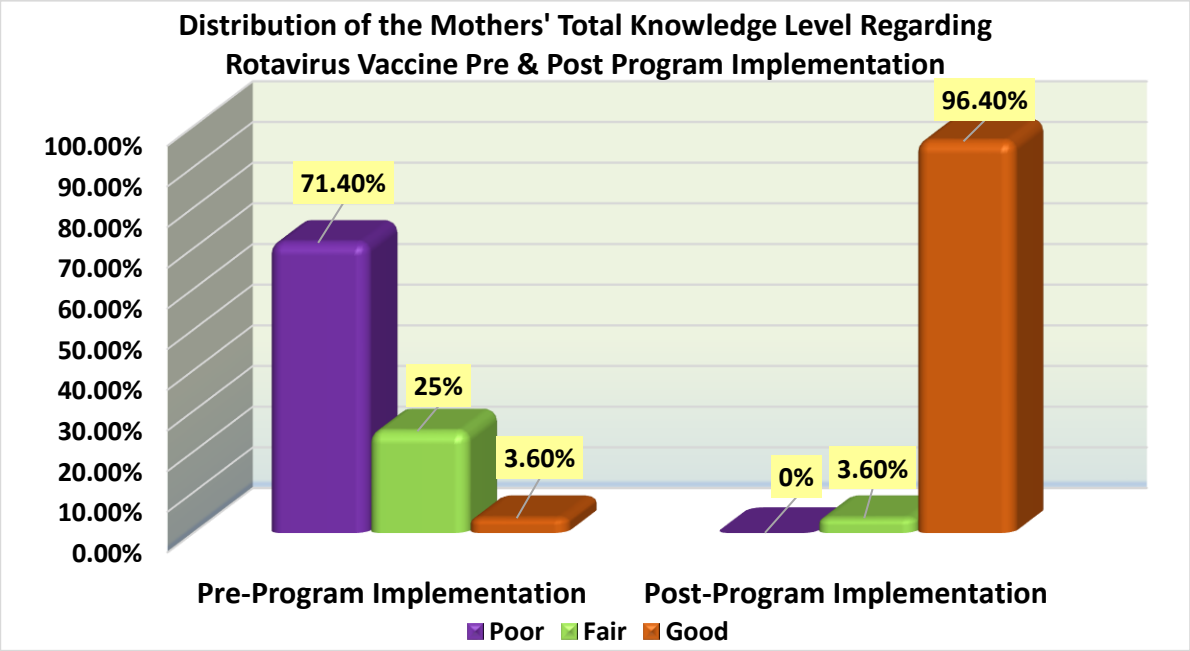

Figure (3) Distributions of mothers' total knowledge scores regarding rotavirus vaccine (n= 56).

Part III: Mothers total attitudes scores regarding rotavirus diarrhea & rotavirus vaccine in pre and posttest (Figure 4 &5).

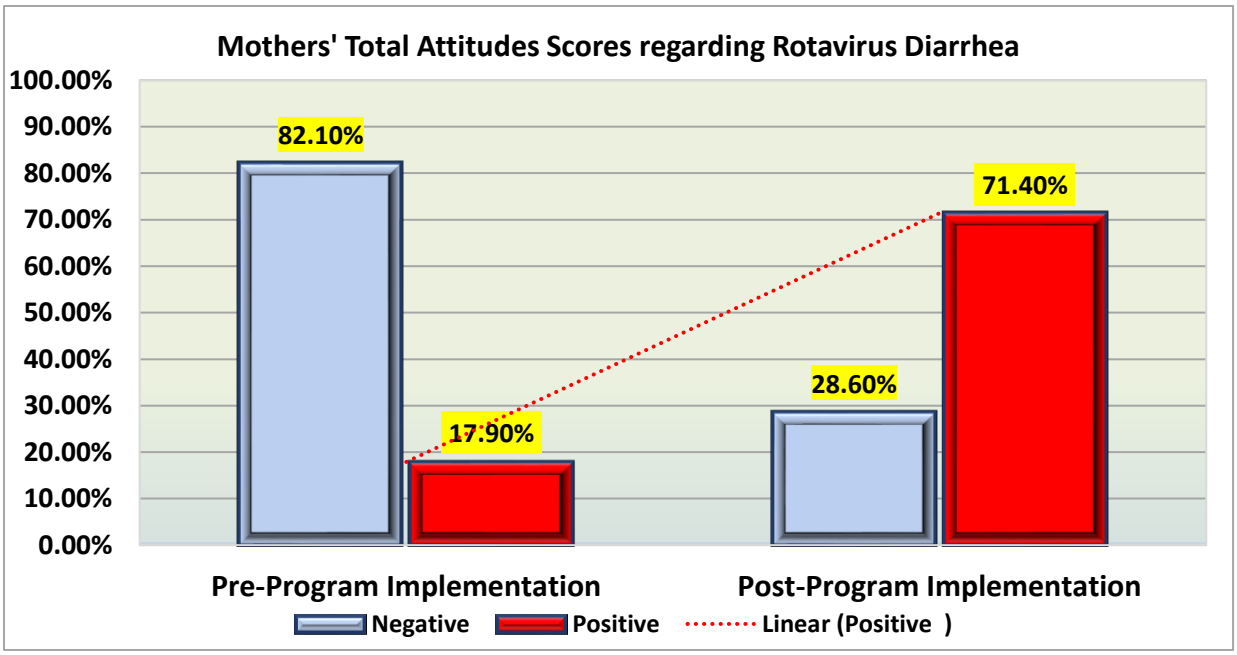

Figure (4) Distributions of mothers' total attitudes scores regarding rotavirus diarrhea (n= 56).
Scores ≥ 75% referred to positive attitude and Scores < 75% referred to negative attitude.

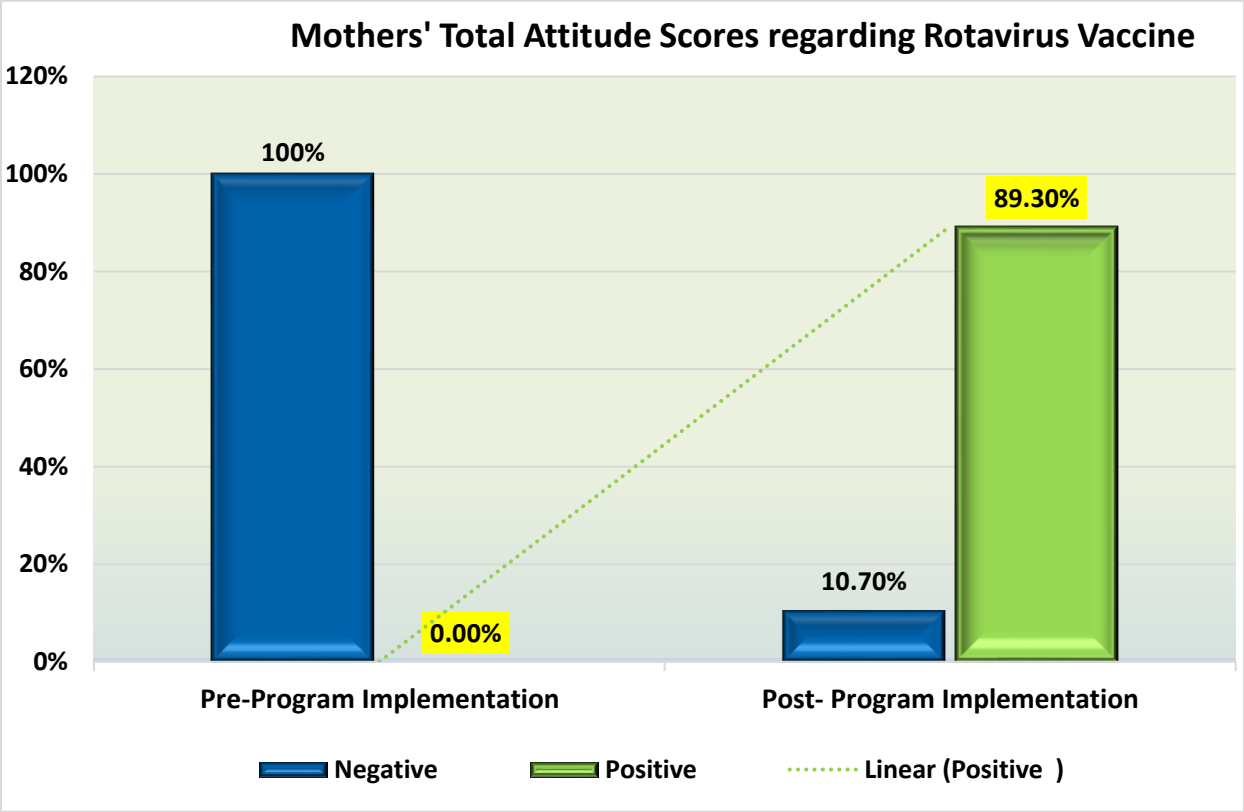

Figure (5) Distributions of mothers' total attitudes scores regarding rotavirus vaccine (n= 56).

Part IV: Part V: Relation between variables under the study pre & post program implementation (n= 56) (tables 3,4, &5)

Table 3: Correlation Between the Mothers' Total Knowledge, Attitudes Scores and Their Socio-Demographic Characteristics

Socio-demographic Characteristics	Total Knowledge		Total Attitudes	
	r	p	r	p
Place of residence	-.036	.708	-.206	.029*
Father's education	.038	.688	.194	.040*
Mother's education	.068	.474	.208	.028*
Number of family members	-.216	.002**	.021	.828
Family income	.213	.024*	.325	.000**

** Correlation is highly significant at the level of ≤ .01

* Correlation is significant at the level of ≤ .05

Table 4: Correlation Between Mothers' Knowledge, Attitudes and Their Total Socio-Economic Characteristics

Study Variable	Total Knowledge		Total Attitudes	
	r	p	r	p
Total socio-economic characteristics	-.060	.660	.484	.000**

** Correlation is highly significant at the level of ≤ .01
* Correlation is significant at the level of ≤ .05

Table 5: Differences between mothers' total knowledge scores and total attitude scores regarding rotavirus diarrhea and vaccine pre and post program implementation (n = 56).

Variables		Mean ± SD	t	F	p
Knowledge regarding Rotavirus	**Pre**	34.0536± 2.65206	14.893	74.126	0.000**
	Post	39.7857± 1.12354			
Attitude toward Rotavirus	**Pre**	25.5714± 3.95822	7.081	87.827	0.000**
	Post	29.8929±2.27779			
Knowledge regarding Vaccine	**Pre**	13.2500± 1.58688	32.515	84.146	0.000**
	Post	21.0714± .84975			
Attitude toward vaccine	**Pre**	4.5714± 2.21447	32.790	104.327	0.000**
	Post	16.9286± 1.74624			

**highly significant difference at the level of ≤ .01

Discussion

The current study was carried out among fifty-six mothers with their children who attended vaccination clinics. In the present study, the majority of the mothers were married to housewives, and almost half of them were aged 25<30 years old, with a mean age of 34.64 ± 4.24 years old. Half of the mothers had a secondary education, and more than half had low socioeconomic status. Regarding the number of family members in the house, three-quarters of mothers had more than four members in their family. Concerning place of residence, half of the mothers were from urban areas, while the rest were from slum areas.

These results are corroborated by Abdel-Aziz, Mowafy, and Galal, (2016), who conducted a study in Al-Darb Al-Ahamar district, Cairo, Egypt on six hundred mothers having children under five years old to assess maternal knowledge about diarrhea and implement community-based health education messages and reported that almost half of the mothers' age ranged between 20–30 years, with a mean of 28.9 ± 2.4 years old , more than one third of them had secondary education, and more than half of them were housewives and came from urban areas.

Similar findings were observed by Padhy, Sethi, and Behera, (2017), who conducted a study on three hundred mothers in the Department of Pediatrics, Maharaja Krishna Chandra Gajapati Medical College, and found that less than three-quarters of them were in the age group of 21–30 years, and less than half of them had a secondary education. They also found that most of the mothers belonged to either the lower middle or lower socioeconomic category and that three-quarters of mothers had more than four members in their family. In addition to Workie, Sharifabdilahi & Addis (2018), who conducted their study on 295 mothers who had under-five children with diarrhea in Diredawa hospitals in Ethiopia, reported that half of them were between the ages of 25–31 years, with a mean age of 27, the majority of them were married, and more than half of them were housewives; they had a secondary education; and they were from a low socioeconomic position. It is obvious that the similarity in socio-economic characteristics between the current study and previous studies is due to the fact that they are all contributing factors to the emergence of rotavirus diarrheal disease.

As for past medical history of diarrhea, all mothers reported that their children under 5 years of age had acute watery diarrhea, and most of them reported recurrent diarrhea and gastroenteritis. Regarding the reaction of mothers when children have diarrhea or gastroenteritis, half of the mothers go to the hospital for treatment, and the other half give medication at home. These findings support the recommendations of the World Health Organization (2018) to include the rotavirus vaccine in the childhood immunization program because rotavirus infection is the most common cause of acute diarrhea in childhood, and is often associated with dehydration, hospitalization, and death, especially in children under 5 years of age.

The current study's findings revealed that, before the program's implementation, less than one-fifth of the mothers had a good level of knowledge about RVD (the disease's nature, contagiousness, high-risk age group, modes of transmission, causes, prevention, oral rehydration solution, role of breastfeeding in relation to diarrhea, assessment of dehydration and danger signs of diarrhea, dehydration treatment), which increased to more than three quarters after the program's implementation. The results of the current study also revealed that a minority of mothers had a good level of knowledge about RVV (importance of vaccine, timetable, doses, routes of administration, side effects, and the places where the vaccine is available) prior to the program's implementation, compared to the majority of mothers who had a good level of knowledge about RVV after its implementation. According to the results of the current study, fewer than a quarter of mothers had positive attitudes towards RVD before the program compared to more than two thirds after it. Also, prior to implementing the program, none of the participating mothers had positive attitudes toward the RVV, but after program implementation, the majority of them had positive attitudes toward RVV. Also, prior to implementing the program, none of the participating mothers had positive attitudes toward the RVV, but after program implementation, the majority of them had positive attitudes toward RVV.

The previously mentioned results mean that the educational program significantly affected the mothers' knowledge of the rotavirus vaccine. This result is congruent with Aromoke and Ojewole (2017), who conducted a study on thirty mothers to assess the influence of a nurse-led educational program on mothers' knowledge and readiness for the rotavirus vaccine in Ikenne Local

Government, Ogun State, Nigeria, and reported that less than one third of the mothers had good knowledge of the rotavirus vaccine before implementing the educational program and that there was a significant difference between the mothers' baseline knowledge and the newly acquired knowledge of the rotavirus vaccine following the educational program. This result means that the educational program significantly affected the mothers' knowledge of the rotavirus vaccine.

There was a highly statistically significant difference between mothers' total knowledge scores and total attitudes scores regarding RVD and vaccine in pre and post program implementation. These results mean that the mothers' knowledge had an effect on their attitudes. This goes in the same line as many studies as by Padhy et al. (2017), Workie et al. (2018), and Viateur (2018), who conducted a study on 150 mothers who have children ages 5 years old and below in Santa Rosa city and Silang Cavite to find out the determinants of preventive practices against acute gastroenteritis among the participated mothers and found that there was a strong significant relationship between mothers' knowledge, attitude, and belief with their preventive practices against children with diarrhea. This is true because when mothers are provided with basic knowledge about their children's condition and various treatment approaches, this will assist them in adopting new and healthy positive attitudes or changing unhealthy negative attitudes.

The result of the current study highlights the existence of a highly statistically significant negative correlation between the number of family members and total knowledge scores ($P = 0.002$). This finding was consistent with that reported by Hungerford, Vivancos, Read, Iturriza-Gomara, French, & Cunliffe (2018), who conducted a study in the metropolitan area of Merseyside, England to evaluate vaccine impact across a health system in relation to socioeconomic deprivation and found that in families with more than four members, there was noticed poor knowledge and a negative attitude of mothers toward rotavirus vaccine. This is logical as the increasing number of family members in the family increases the physical and economic burden on mothers, which hampers them from seeking new information or even concern about their child's nutrition or environmental sanitation.

The current study indicated that, no significant association was found between parents' educational level and their overall knowledge. In contrast, a study conducted by Viateur (2018) on one hundred and fifty mothers in Santa Rosa and Selange Cavite to assess the determinants of preventive practices against acute gastroenteritis among selected mothers found statistical significance between mothers' knowledge about acute gastroenteritis prevention and mothers' education. This difference is likely due to the small percentage of fathers or mothers in our sample who completed higher education.

Furthermore, there was a statistically significant negative association between mothers' total attitudes scores and place of residence, indicating that mothers living in urban slums face important barriers to vaccinating their infants with vaccines that are not provided routinely because of high vaccine prices, low education, and very low awareness about the vaccines.

The results also reflected a highly statistically significant positive correlation between the mothers' total knowledge scores and total attitudes scores and the family income. As the rotavirus vaccine is not included in the Egyptian National Immunization Program (ENIP), mothers

recognized it as not essential, and they were concerned regarding the safety and benefit of the vaccine due to the perceived newness of the vaccine. Other concerns were that the vaccine was too costly.

A highly statistically significant positive correlation was found between mothers' total socioeconomic characteristics and their total attitude scores. This finding was supported by the findings of Padhy et al., (2017), who found that mothers with a higher socioeconomic status had better knowledge of diarrheal disease as well as attitudes and practices in the management and prevention of diarrhea. Additionally, a previous study by Yilgwan and Okolo (2012) on the incidence of the incidence of diarrhea disease and risk factors in Jos University Teaching Hospital, Nigeria, showed a direct relation between the prevalence of diarrhea and the education and socioeconomic status of mothers. In the same context, Hungerford et al., (2018), who conducted a study in the metropolitan area of Merseyside, England to assess the impact of vaccines in relation to socioeconomic deprivation, found a strong correlation between the socioeconomic levels of the parents and their knowledge and attitudes toward rotavirus vaccine.

Conclusion

The current study's findings concluded that there was an improvement in the mothers' knowledge and attitudes after the implementation of the Rotavirus Education Program. A highly statistically significant difference was found pre and post the program. There was a highly significant difference in mothers' total knowledge and total attitude scores about rotavirus diarrhea and its vaccine ($P = 0.000$). In the posttest, the mothers' total knowledge and attitude were higher than in the pretest.

Recommendations

The researchers recommended the following issues, considering their study's findings:

- Ongoing rotavirus education programs are offered to mothers at family health centers that will consequently enhance mothers' knowledge, have a positive effect on treatment of rotavirus diarrhea and improve the health status of their children in the community.
- Using media-based health education programs for rotavirus diarrhea prevention.
- Timely addition of the rotavirus vaccine to the Egyptian mandatory immunization program where it is publicly available.
- Reapplying this study to a large sample of the population

Limitations of the study

The limitation of this study was the number of study samples that cannot represent the entire population of Egypt. However, this study is expected to give insight regarding knowledge and attitudes of mothers in Egypt towards rotavirus diarrhea and vaccine. Future study should be expanded to larger area and sample size to precisely represent Egyptian population.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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