

Effect of An Educational Intervention on Knowledge, Practices and Attitudes of Mothers with Breast Feeding Infants Regarding Antibiotic Use and Resistance

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Abstract

Background: Irrational breast feeding mothers' use of antibiotics is a key reason for increasing and spreading of antibiotic resistance among their infants. **Aim:** to evaluate the effect of an educational intervention on knowledge, practices and attitudes of mothers with breast feeding infants regarding antibiotic use and resistance on their infants. **Subjects & method:** A quasi-experimental research design was utilized in the present study. A convenience sampling of 60 breast feeding mothers and their infants was included in this study at Tanta City Maternal and Child Health Centers (Pottors, Embaby and Segar centers). **Tools:** Three tools were used, **Tool I:** Mothers' knowledge regarding antibiotic use and resistance questionnaire which consisted of three parts. **Part 1:** breast feeding mothers' characteristics, **Part 2:** socio-demographic characteristics of the infants and **Part 3:** mothers' knowledge about antibiotic use and resistance. **Tool II:** Breast feeding mothers' reported practices regarding antibiotic use and resistance. **Tool III:** Breast feeding mothers' attitudes regarding antibiotic use and resistance. **Results:** all studied mothers had low scores of knowledge, majority of them had unsatisfactory reported practices and negative attitudes before the educational intervention implementation, while mothers' knowledge, practices and attitudes were improved immediately and after two months from the educational intervention implementation. **Conclusion:** there was a significant improvement of mothers' knowledge, practices and attitudes regarding antibiotic use & resistance after the educational intervention implementation. **Recommendations:** Health educational programs for breast feeding mothers should be conducted periodically and regularly regarding antibiotic use and occurrence of antibiotic resistance among their infants.

Keywords: Antibiotic use, Attitudes, Breast feeding mothers, Educational intervention, Infants, knowledge, Practices and Resistance

Introduction

Breast milk is considering the main source for newborns and infants' feeding. It supplies them with all the necessary nutrients in proper proportions and protects them against allergies, diseases and infection (Wong's 2014). World Health Organization(WHO) recommends that breastfeeding must be exclusive during the first 6 months and supplemented up to 2 years (WHO 2014).

Multiple causes during breast feeding period can be arising that required mother's pharmacological treatment. It was found that up to 20% of mothers require antimicrobial drugs during the first year after delivery (Rock et al 2017). One of the issues in the breast feeding period is the safety of medication being used by mothers, because of transferring of the drug over the mammary glands to suckling infants may lead to side effects on them (Suaifan 2012).

The most common medications prescribed during lactation period are antibiotics. They are a crucial, life-saving medications that widely used to treat and prevent infectious diseases caused by bacteria and that infrequently have antiprotozoal efficacy. (Wong's 2014, Davey et al 2008 & Ferech et al 2011). They are inappropriate for viral diseases such as the majority of coughs and colds. However, there are different situations when their use is important and even lifesaving (CDC 2012).

In general, antibiotics are prescribed more sparingly than they were in the past due to mounting evidence of their ineffectiveness, and increased resistance in some organisms. There are many causes of mothers' misuse of antibiotic as her diagnostic uncertainty, mothers' good expectations of certain antibiotic action, lack of mothers' understanding and health care professionals' education as well as pharmaceutical marketing and the sale of antibiotic without a prescription (WHO

2014&Andre et al 2010). The majority of antibiotics is thought to be compatible with breast feeding mothers at the low end of the recommended dosage range to be appropriate for use (CDC 2012).

Consumption of antibiotics is generally recognized as the primary cause for their resistance occurrence (Sun et al 2012&Fonseca et al 2012). Resistance to antibiotics forms a great problem that happens when bacteria and fungi develop the ability to defeat the drugs designed to kill them. This means that they are not killed, continue to grow and antibiotics lose their effectiveness (Wang et al 2019). Antibiotics resistance in infants mainly occurs due to irrational use of breast feeding mothers' antibiotics that is considered an ongoing essential health problem and needed more attention. (Andre et al 2010).

Antibiotics use during breastfeeding may be transferred to infants through breast milk and affect both the volume of milk and the newborn or infant's health. The causes of transferring antibiotics through breast milk that may affect infant and cause resistance include; factors related to mothers and infants. Factors related to mothers include; pH of breast milk, milk proteins, variation in composition of breast milk with time, dose, frequency of medication, lipid solubility of medication and milk volume. In addition to mammary blood flow, drug metabolism in breast tissue. Factors related to infants are gestational age dependent capacity to handle drugs, gastrointestinal emptying time, gastro-esophageal reflux, intestinal surface area, duration, frequency of feeding and unpredictable idiosyncratic reactions (Wisner 2020).

Providing mothers with nursing health education about breast feeding and antibiotic treatment and their awareness of antibiotic resistance are thought to affect their demand to use antibiotic. Reducing antibiotic use is a central strategy for minimizing antibiotic resistance (Rangi et al 2018 & Scott et al 2018). One important measure to reduce the development and spread of antibiotics resistance is rational use of them. Most of antibiotic resistance control strategies recommended mothers' education to promote their appropriate antibiotic use and mothers should seek medical advice when they want to

take any antibiotics especially during period of lactation (WHO 2012, Bell et al 2014&Ibcic 2021).

Significance of the study:

Antibiotic resistance may develop if newborns and infants gets antibiotics in breast milk due to long-term sub therapeutic transmission of it, that become one of the greatest health threats globally. Infection with antimicrobial resistant organism resulted in increased infant's morbidity and mortality (Fahim 2012 &Tahoon 2020). It was estimated that over 700.000 deaths occurred worldwide each year included 214,000 neonatal sepsis that are attributable to antimicrobial resistant bacterial pathogens. Antibiotic resistance need implementation of steward programs and this should be preceded by making available evidence- based knowledge regarding antibiotic use and resistance (Laxminarayan et al 2016).So the aim of this study was to evaluate the effect of an educational intervention on breast feeding mothers' knowledge, practices and attitudes regarding antibiotic use and resistance on their infants.

Aim of the present study:

The present study was conducted to evaluate the effect of an educational intervention on knowledge, practices and attitudes of mothers with breast feeding infants regarding antibiotic use and resistance

The objectives of this research were to:

- Assess breast feeding mothers' knowledge regarding antibiotic use and resistance
- Assess breast feeding mothers' reported practices regarding antibiotic use and resistance
- Assess breast feeding mothers' attitudes regarding antibiotic use and resistance
- Decrease dangerous effects of antibiotic resistance

Research Hypothesis:

- H¹:** The mothers' knowledge regarding antibiotic use and resistance is expected to be improved after the implementation of an educational intervention
- H²:** The mothers' practices regarding antibiotic use and resistance is expected to be improved after the implementation of an educational intervention
- H³:** The mothers' attitudes regarding antibiotic use and resistance is expected to be

improved after the implementation of an educational intervention

Subjects and Method

Research Design

A quasi-experimental research design using one group (before, immediate and after two months) was utilized in the current study. Pretest and posttest quasi-experimental research design type means that there is testing of a dependent variable (knowledge, practices and attitudes) before and after intervention with an independent variable (educational intervention)

Setting

This study was conducted at immunization clinics of Maternal and Child Health Centers that are affiliated to Ministry of Health and Population such as Pottors, Embaby and Segar in Tanta City, El Gharbia governorate, Egypt. Each one of the previous mentioned centers consisted of Immunization, Dental, Antenatal, Family planning, Child out patient, Child follow up, and Emergency clinic.

Subjects

A convenience sampling of sixty (60) breast feeding mothers who were attended the previously mentioned setting for getting their infant's obligatory immunization. The size of sample was based on the following parameters confidence level error level 5% type I error 0.05 and power of test 95%.

Data Collection Tools

Three tools for data collection were used:

Tool I: Structured Interview Questionnaire

It was developed by the researchers after review of the related literatures (**Fonseca et al 2012 & Andre et al 2010**) to assess mothers' knowledge regarding antibiotic use and resistance. It consisted of three parts:

Part 1: Breast feeding mothers' characteristics which included; their age, educational level, marital status, occupation, residence, type of antibiotic they frequently used, and last time of taking the antibiotic.

Part 2: Socio-demographic characteristics of the infants such as age, sex and birth order.

Part 3: Mothers' knowledge about antibiotic use and resistance. It included; questions related to antibiotic as meaning, indications, method of obtaining, time of taking, time of stop taking, side effects, and factors that determine the effects of maternal antibiotic use on infants in addition to

definition, causes, and prevention of antibiotic resistance.

- Scoring system for mothers' knowledge:

This part-contained 10 questions and the scoring range for each question was from 0 to 2 grades. The correct and complete answers were given a score of 2, correct and incomplete answers were given a score of 1 and wrong answers or didn't answered questions were given a score of zero. The sum of all questions was 20. The total scores of mothers' knowledge were calculated and classified as follows: <60 % was considered low knowledge, from 60-<75 % was considered moderate knowledge, and 75- 100 % was considered high knowledge.

Tool II: Self-reported Practice Questionnaire:

This tool developed by the researchers following a review of the recent related literature. (**Hambal, I., Dadari, S. 2020**). It was consisted of 8 items. Two levels of scoring for each question were used: correct answer was scored 1 and incorrect answer was scored 0. The sum of all mothers' reported practices items were 8. Total scores of mothers' reported practices were calculated and classified as follows: <60% were considered unsatisfactory practice and $\geq 60\%$ were considered satisfactory practice.

Tool III: Breast Feeding Mothers' Attitudes scale

The researchers were developed this tool following a review of the related literatures (**Mohammed & Abd Elkader 2021**). The mothers' attitudes were measured by using a three points Likert scale which were agree, uncertain and disagree. The mothers' agree response was scored (2), uncertain response was scored (1) and disagree response was scored (0). It included 13 statements such as I think that antibiotic is not cure all diseases, I think that the majority of antibiotics are safe to consume during lactation, I think the antibiotics I take can affect my infant and I think that my antibiotic use doesn't affect my breast milk supply.

Total score of mothers' attitudes was as the following:

- Negative attitude: <60% (0 - 15)
- Natural attitude: 60-<75%(16-19)
- Positive attitude: >75% (20 -26)

Method

The study was carried out after getting an official permission from the responsible authorities, participants' oral consent was obtained, their privacy was considered, every

mother was assured that all information gathered will be confidential and she was free to withdraw from the study at any time, the developed tools were validated by five experts in nursing fields and content validity index was 96%, reliability of the developed tools was tested through the internal consistency and the value of Cronbach's alpha coefficient was 0.960. The pilot study was conducted on 6 mothers to test the clarity and applicability of the study tools, the necessary modifications was done in the form of questions rearrangement, and restatement for some items. The data collection process was done within three phases:

1-Assessment Phase:

- It was carried out by the researchers for all study participants to collect their baseline information. The researchers were available 4 days per week from 9:00Am to 12:30 Pm to assess mothers' knowledge about antibiotic use and resistance before, immediate and after two months (in the next visit for infant's immunization) from educational intervention implementation Tool I (Part 3). Mothers' reported practices and attitudes regarding antibiotic use and resistance were assessed before, immediate and after two month of intervention implementation by using Tool II&III.
- The researchers conducted individual or group interviews with mothers to fill the questionnaire sheet. The average time required for each mother ranged from 20- 30 minutes. The researchers ensured that all questions were filled and instructed the mothers to answer any incomplete questions.

2- Implementation Phase was included preparatory and intervention phase:

Preparatory (educational intervention program development) phase:

The educational program was developed on the basis of the review of related research studies and review of the literatures. It was tailored to the identified needs and demands of mothers in Arabic language and developed according to the mothers' level of understanding. The content was included all goals behind the application of the session.

- Intervention phase:

The educational intervention program was carried out through four sessions and two sessions

were conducted daily for 4 days per week. Time of each session was from 25-35minutes. At the beginning of the first session, mothers were informed about the educational intervention content, purpose, and its effect on their infants' health status. Each session was begun by a summary about what has been discussed in the previous session and the objectives of the current session, using simple Arabic language and different teaching media (lectures, demonstration, group discussion and audiovisual materials) were used relevant to program contents to facilitate mothers' understanding. The sessions were concentrated on the following topics

The first session: related to meaning, indications, and method of obtaining the antibiotic.

The second session: focused on correct time of taking antibiotic for breast feeding mothers, time of stop taking it, its side effects, and factors that determine the effects of maternal antibiotic use on infants.

The third session: related to definition, causes, and prevention of antibiotic resistance in infants.

The fourth session: concentrated on the important guidelines for breast feeding mothers about proper antibiotic use and its resistance

Each session concluded with a summary of its contents and mothers' feedback was received to ensure that they got the maximum benefits.

3- Evaluation phase:

- The results of the before and after tests were compared to determine how the educational intervention affected mothers' knowledge, reported practices and attitudes. This phase was done three times before, immediately after completing the implementation phase, and then after two months (next visit). The data was gathered through a period of three months from January to March 2021.

Results

Table (1) shows percentage distribution of breast feeding mothers' characteristics. Regarding their age, it was found that more than one half of studied mothers (56.7%) were between 20 to less than 30 years old with the mean age (27.850 ± 5.041). In relation to their

marital status, it was cleared that majority of them (96.7%) were married. Regarding their education, nearly third (31.7%) of mothers had diplom education. The table also shows that most of them (80%) weren't working. As regards number of children in family, it was found that nearly half of them (48.3%) had one child. Regarding their residence, it was observed that, majority of them (88.3%) were from rural area. as regards common antibiotic used the table presents that one third (33.3%) and one quarter (25%) of mothers used augmentin and cefotax respectively. Regarding last time of taking antibiotic by mothers, it was found that half of them (50%) couldn't remember last time of taking it.

Table (2) shows Percentage distribution of the breast feeding infants' characteristics. It was observed that nearly half of them (41.7%), their age was between 3-4 months. In relation to their sex, it was found that more than half of them (53.3%) were female. as regards their birth order, it was found that nearly two thirds of them (63.4%) were the first one.

Table (3) shows Total scores of breast feeding mothers' knowledge related to antibiotic use and resistance before, immediately and two months after implementation of educational intervention. It was observed that, all mothers (100%) had low scores of knowledge before the implementation of educational intervention. While immediately and after two months 93.3% and 80% of them had high knowledge scores respectively with highly statistically significant difference before, immediately and after two months from the educational intervention implementation with $X^2=188.923$, $P= 0.0001$. The mean of total knowledge scores of mothers was 6.766 ± 1.968 , 18.76 ± 1.916 and 16.96 ± 2.299 before, immediately and after two months from the educational intervention implementation respectively.

Table (4) shows Total scores of breast feeding mothers' reported practices related to antibiotic use and resistance before, immediately and two months after implementation of educational intervention. It was revealed that, the majority of mothers (95%) had unsatisfactory scores of reported practices before the educational intervention

implementation. While immediately and after two months, majority of them (90%) and (88.3%) had high reported practices scores respectively with highly statistically significant difference before, immediately and after two months from the educational intervention implementation with $X^2=119.268$, $P= 0.0001$. The mean of total reported practices scores of mothers were 2.850 ± 1.086 , 6.633 ± 1.275 and 5.900 ± 1.160 before, immediately and after two months from the educational intervention implementation respectively.

Table (5) shows Total scores of breast feeding mothers' attitudes related to antibiotic use and resistance before, immediately and two months after implementation of educational intervention. It was revealed that, the majority of mothers (98.3%) had negative attitude scores before the implementation of educational intervention. While immediately and after two months most of them (83.3%) and (81.7%) had positive and neutral attitude scores respectively with highly statistically significant difference before, immediately and after two months from the educational intervention implementation with $X^2=246.592$, $P= 0.0001$. The mean of total mothers' attitude scores were 6.500 ± 2.295 , 21.566 ± 1.968 and 17.916 ± 1.381 before, immediately and after two months from the educational intervention implementation respectively.

Table (6) shows correlation between total scores of breast feeding mothers' knowledge, reported practices, and attitudes related to antibiotic use and resistance before, immediately and after two months from the educational intervention implementation. It was cleared that, there was significant and highly significant correlation between mothers' knowledge, reported practices, and attitudes immediately and after two months from the educational intervention implementation where ($P=0.012$ and $P=0.0001$) respectively

Table (1): Percentage distribution of breast feeding mothers' characteristics (n=60)

Breast feeding mothers' characteristics	(n=60)	
	No.	%
Age (years)		
Less than 20	4	6.7
20 - Less than 30	34	56.7
30 - Less than 40	21	35.0
More than 40	1	1.6
Range	18 – 40	
Mean ± SD	27.850 ± 5.041	
Marital status		
Married	58	96.7
Divorced	2	3.3
Level of Education		
Illiterate	2	3.3
Read and write	6	10.0
Primary	10	16.7
Preparatory	11	18.3
Secondary	6	10.0
University	6	10.0
Diplom	19	31.7
Occupation		
Working	12	20.0
Not working	48	80.0
Number of children in the family		
One	29	48.3
Two	25	41.7
Three	6	10.0
Residence		
Urban	7	11.7
Rural	53	88.3
the common antibiotics used		
Cefotax	15	25.0
Augmentin	20	33.3
Flumox	19	31.7
Othes	6	10.0
last time of taking antibiotics		
Last month	15	25.0
Last six months	15	25.0
Can't remember	30	50.0

Table (2): Percentage distribution of breast feeding infants' characteristics (n=60)

Characteristics of breast feed infants	(n=60)	
	No.	%
Age (months)		
1 – 2	18	30.0
3 – 4	25	41.7
5 - 6	17	28.3
Range	2 – 6	
Mean ± SD	3.883 ± 1.450	
Sex		
Male	28	46.7
Female	32	53.3
Birth order		
First	38	63.4
Second	20	33.3
Third	2	3.3

Table (3): Total scores of breast feeding mothers' knowledge related to antibiotic use and resistance (n=60)

Total scores of breast feeding mothers' knowledge related to antibiotic use and resistance	(n =60)						χ^2 P
	Before (n=60)		Immediate after (n =60)		Two months after (n =60)		
	No.	%	No.	%	No.	%	
Low knowledge: <60% (0 - 11)	60	100.0	0	0.0	0	0.0	188.923 0.0001**
Moderate knowledge: 60 -<75% (12 - 14)	0	0.0	4	6.7	12	20.0	
High knowledge: >75% (15 -20)	0	0.0	56	93.3	48	80.0	
Range	3: 11		12: 20		12: 20		
Mean \pm SD	6.766 \pm 1.968		18.76 \pm 1.916		16.96 \pm 2.299		
F value	582.106						
P	0.0001**						

** Highly Statistically Significant difference at (P<0.05)

Table (4): Total scores of breast-feeding mothers' reported practices related to antibiotic use and resistance (n=60)

Total scores of breast-feeding mothers' reported practices related to antibiotic use and resistance	(n =60)						χ^2 P
	Before (n=60)		Immediate after (n =60)		Two months after (n =60)		
	No.	%	No.	%	No.	%	
Unsatisfactory practice: <60% (0 - 4)	57	95.0	6	10.0	7	11.7	119.268 0.0001**
Satisfactory practice: 60 - 100% (5 - 8)	3	5.0	54	90.0	53	88.3	
Range	0: 5		3: 8		3: 8		
Mean \pm SD	2.850 \pm 1.086		6.633 \pm 1.275		5.900 \pm 1.160		
F value	174.511						
P	0.0001**						

** Highly Statistically Significant difference at (P<0.05)

Table (5): Total scores of breast feeding mothers' attitudes related to antibiotic use and resistance (n=60)

Total scores of breast feeding mothers' attitudes	(n =60)						χ^2 P
	Before (n=60)		Immediate after (n =60)		Two months after (n =60)		
	No.	%	No.	%	No.	%	
Negative attitude: <60% (0 - 15)	59	98.3	0	0.0	3	5.0	246.592 0.0001**
Natural attitude: 60 -<75% (16 - 19)	1	1.7	10	16.7	49	81.7	
Positive attitude: >75% (20 -26)	0	0.0	50	83.3	8	13.3	
Range	2: 17		18: 25		15: 20		
Mean \pm SD	6.500 \pm 2.295		21.566 \pm 1.968		17.916 \pm 1.381		
F value	1005.771						
P	0.0001**						

** Highly Statistically Significant difference at (P<0.05)

Table (6): Correlation between total scores of breast feeding mothers' knowledge, reported practices, and attitudes related to antibiotic use and resistance.

The studied breast-feeding mothers' reported practices and attitudes	Total knowledge level (n=60)					
	Before		Immediate after		Two months after	
	R	P	r	P	r	P
Total practice scores	0.213	0.102	0.290	0.024*	0.217	0.014*
Total attitude scores	0.025	0.842	0.315	0.012*	0.599	0.0001**

* Statistically Significant difference at (P<0.05)

** Highly Statistically Significant difference at (P<0.01)

Discussion

Antibiotics use was increasing now a day that lead to increases the chance of inappropriate use. The incorrect use of antibiotics can cause potential harm for parents and their infants' health and cause bacterial resistance. Knowledge, practice and attitudes toward are needed to be focused to increase the awareness about antibiotic use and resistance (Shawg et al 2020).

The present study revealed that all mothers had low scores regarding their knowledge about antibiotic use and resistance, before the educational intervention implementation. This may be due to their low level of education and majority of them were from rural area where there is inadequate health care facilities and reduction in health educational programs that were provided to mothers. This result was in agreement with Hambal&Dadari (2018) who found that breastfeeding mothers have a general lack of knowledge about antibiotics use and resistance before the intervention implementation. On the other hand, the study of Zeruet al., (2020) who mentioned that nearly half of mothers had a good level of knowledge about antibiotic use in assessment phase and it was in contract with this study.

As regards mothers' knowledge after the educational intervention implementation in the present study, it was found that most of them had high knowledge scores before, immediately and after two months from the educational intervention implementation with a highly statistically significant difference. It may be due to effectiveness of educational intervention which developed based on mothers' needs and consequently improving their knowledge.

This result was in agreement with the study of Odili & Ahwinahwi (2021) who found more

than half of mothers had good knowledge scores after an educational intervention implementation. Mohammed & Abd El-kader (2021) who mentioned that there was an improvement of mothers' overall level of knowledge about appropriate use of antibiotics and resistance after educational intervention and in follow up with highly statistically significant difference also was agreed with the present study.

The present study found that majority of mothers had unsatisfactory scores of reported practices before the educational intervention implementation. This may be due to lack of mothers' knowledge and awareness about the side effects of their inappropriate use of antibiotics on their infants. While immediately and after two months, majority of them had high reported practices scores. This may be due to mothers become aware about the side effects of misusing antibiotic on themselves and their infants. This finding was in harmony with Mohammed & Abd El-kader (2021) who found that there is satisfactory practice score of mothers regarding appropriate antibiotic use after implementing the educational intervention which lead to improvement in their practice. Kandeel et al (2019) who mentioned that appropriate antibiotic practice improved after educational intervention was in agreement with this study.

The finding of the present study revealed that majority of mothers had negative attitude scores before the educational intervention implementation. While immediately and after two months most of them had positive and neutral attitude scores with highly statistically significant difference before, immediately and after two months from the educational intervention implementation. It may be due to gaining of mothers a new information and skills

from educational intervention, clarity, simplicity of it and availability of researchers in the field for more clarification.

The study of **Taylor et al (2019)** was in the same line of the present study that focused on the effectiveness of educational materials in improving attitudes of parents about antibiotic use and reported that overall attitudes scores of mothers were unsatisfactory before the educational program and improve after it.

Regarding correlation between mothers' knowledge, reported practices, and attitudes immediately and after two months from the educational intervention implementation. The present study showed that, there was a positive significant and highly significant correlation between them. The researchers can illustrate this result as mothers' knowledge improvement after educational intervention lead to change of their practices from unsatisfactory to satisfactory and their attitudes from negative to positive.

The study of **Alkhalidi et al (2015)** was disagreed with the present study as they mentioned that mothers' knowledge was not translated into positive attitudes or good practices after educational program implementation.

Conclusion:

Based on the finding of the present study, it was concluded that, there was a significant improvement in total mothers' knowledge, practices and attitudes immediately and two months after implementation of an educational intervention. Also there was a significant and highly significant correlation between mothers' knowledge, reported practices, and attitudes immediately and after two months from the educational program implementation.

Recommendations

- Health educational programs for breast feeding mothers should be conducted periodically and regularly regarding antibiotic use and occurrence of antibiotic resistance among their infants.
- Providing all breast feeding mothers with manual booklet about their proper antibiotic use and antibiotic resistance during receiving their infants' obligatory immunizations.

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