

Determinants of Antibiotics Misuse by the Mothers in Children Under Five Years at Alexandria Governorate- Egypt

محددات سوء استخدام المضادات الحيوية من قبل الأمهات في الأطفال دون سن الخامسة في محافظة الإسكندرية - مصر

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Abstract

Background: The threat of antimicrobial resistance due to misuse of antibiotics on 2019 receive the widespread attention deserves, since misuse of antibiotics leads to a lot of problems especially among the under five children. Assessment of the determinant of misuse is highly important.

Aim: The aim of this study was to assess the determinants of antibiotics misuse by the mothers in children under five years, and to assess mothers' knowledge regarding to misuse of antibiotics.

Setting: The study was carried out in eight primary health care settings rendered services for under five children. **Subjects:** The subjects of present study comprised of "400" mothers of under-five children.

Tools: Three tools were used, namely, tool (1); children and their mothers' basic data structured interview schedule, tool (2); mother's knowledge regarding to misuse of antibiotics structured questionnaire and tool (3) mother's use of antibiotics assessment questionnaire.

Results: The study revealed that slightly more than two fifths of the studied women use the antibiotics without acceptable prescription, more than half of the mothers had poor knowledge regarding use of antibiotics and only 6% had good knowledge while slightly more than one third had fair knowledge.

Conclusion: It can be concluded that applying The determinants of antibiotics misuse include mother's self-experience, mother in law experiences, pharmacist prescription of antibiotics with no limitation to doctor orders, far health centers and lack of medication at the centers, low income or inability to pay physician fees, availability of left-over antibiotic, and effect of social media.

Recommendations: The main recommendation of current study was to raising public awareness regarding misuse of antibiotics and its consequences.

Keywords: Antibiotics; Misuse; Resistance; Prescription.; Awareness; left-over antibiotic

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I. Introduction

With the global progress in reduction of child mortality, an increasing concern for the health, development and well-being of the surviving child has emerged. It is estimated that 250 million children are not reaching their developmental potential in developing countries (Urke, 2017). In 2018, the risk of a child dying before completing five years of age is still highest in the WHO African Region (76 per 1000 live births), around 8 times higher than that in the WHO European Region (9 per 1000 live births) reducing these inequities across countries and saving more children's lives by ending preventable child deaths are important priorities (WHO,2018a).

According to WHO (2017), the leading causes of death among children under five in 2017 were preterm birth complications, acute respiratory infections, intrapartum-related complications, congenital anomalies and diarrhea. Ending preventable child deaths can be achieved by providing immediate and exclusive breastfeeding, improving access to skilled health professionals for antenatal, birth, and postnatal care, improving access to nutrition and micronutrients, promoting knowledge of danger signs among family members, improving access to water, sanitation, and hygiene and providing immunizations as well as safe use of antibiotics.

Indeed, children are major consumers of antibiotics, with findings showing a higher intake among children aged 1 to 5 years (65%), in comparison with teenagers (38%) (Aleem et al, 2016). Although most of the common childhood infections such as diarrhea and upper respiratory tract infections are caused by viruses and it

is estimated that 90% of upper respiratory tract infections are self-limiting viral illnesses and even bacterial infections like acute otitis media often run a self-limiting course, large volumes of antibiotics are prescribed for these infections in children in the primary care settings (Aleem et al, 2016, Diminskyte, 2016).

Since their discovery, antibiotics have served as the cornerstone of modern medicine (WHO, 2018b). Antibiotics misuse, is referring to the irrational use or overuse of antibiotics, might threaten any patient from all age groups, which contributing to antibiotic resistance and is currently considered a serious public health concern globally. However, the persistent overuse and misuse of antibiotics have encouraged the emergence and spread of antibiotic resistance, which occurs when microbes, such as bacteria, become resistant to the drugs used to treat them (Bryce et al, 2018, Atif et al, 2018).

Antibiotics misuse crises consequently leads to increased mortality and morbidity among patients as well as it costly for the healthcare systems and its costs are constantly growing due to increased failure of treatment, frequent and prolonged hospitalization, more outpatient and emergency visits, also the number of useful drugs for future generations of patients have reduced significantly (Ventola, 2015). In 2014, a synthesis of evidence and economic review indicated that an estimated 700,000 deaths globally were attributable to infections caused by antibiotic-resistant organisms, and this is expected to reach 10 million/year by 2050 (Zahreddine et al, 2018, Naveed et al, 2015). About 80 per cent of all antibiotics are being used within community settings which means that the usage is very often left unchecked and a vailed without prescriptions (Agarwal et al, 2015, Elong Ekambi et al, 2019).

In developing countries, antibiotic resistance due to misuse is present due to a lack of awareness and regulations, lack of basic healthcare and public health infrastructure, limited access to clean drinking water and a huge deficit of trained healthcare providers. Another factor contributing to spreading resistance is non-therapeutic antibiotic use in animals, where antibiotics are being administered to pigs, cows and chickens in order to promote their growth and prevent possible infections. (Bryce et al, 2018, Padget et al, 2017). Additionally, the reason behind inappropriate use of antibiotics may be that people use antibiotics on self-medication basis and don't follow complete pattern regarding the use of antibiotics. Cultural factors, behavioral, socio-economic factors of patients and level of education also contributing to antibiotic resistance. Once resistance has been established it can't be reversible and hence it will be difficult to treat variety of different infections caused by different organisms (Barker et al, 2017, Torres et al, 2019)

To sum up, community health nurses have a strong potential to leverage the global efforts against antimicrobial resistance. Health education and health awareness regarding good perception are key elements to determine contribution to prevent antibiotic misuse (WHO, 2019b, CDC, 2019). A significant modification of the prescribing habits of physicians as well as community awareness on the harms of misuse and overuse of antibiotics is highly important. It is imperative to educate health workers as well as the community in a coordinated and sustainable manner about the health problem of antibiotic resistance and their role in its prevention (Andermann, 2016, WHO, 2001).

Aims of the study

The study aimed to:

- Assess the determinants of antibiotics misuse by the mothers in children under five years at Alexandria.
- Assess mothers' knowledge regarding to misuse of antibiotics.

Research questions:

- What are the determinants of antibiotics misuse by the mothers in children under five years at Alexandria?
- What is the level of mothers' knowledge regarding to misuse of antibiotics?

II. Materials & Method

Materials

Research design:

A descriptive design was adopted to carry out this study.

Setting:

Multistage sampling technique was used to select study settings as follow; Alexandria governorate was divided into eight health zones namely El Montaza, East, Middle, West, El Gomrok, El Ameria, El Agamy, and Borg El Arab. Eight primary health care settings rendered services for under five children were randomly selected one from each zone to carry out this study.

Subjects:

Using the equal allocation method, a random sample of 50 child's mothers selected from each of the previously mentioned settings. The total sample size was 400 mothers. The sample size was estimate using Epi

info 7 statistical program according to the following parameters; population size 3630, expected frequency 50%, 95% confidence level with 5% maximum error. The minimum sample size estimated to be 347 mothers.

Tools of data collection:

In order to collect the necessary data for the study, the following tools were used.

Tool I: Children And Their Mothers Basic Data Structured Interview Schedule it was developed by the researchers after reviewing recent literature to collect necessary data from the mothers, It included the following data such as child's age, sex, birth order, number of siblings, mother's age, education, occupation, income, residence, and crowding index in addition to the child health history.

Tool II: Mother's Knowledge Regarding To Misuse Of Antibiotics Structured Questionnaire: It is a 22-item questionnaire that was developed by the researchers after reviewing recent literature to assess the mother's knowledge regarding misuse of antibiotics it included the following mother's knowledge regarding the main cause of using antibiotics, harmful effect of overuse of antibiotics, fever / cough and antibiotic use, viral infection and antibiotic use, effect of detergent on immunity, herd immunity, vaccine and antibiotics, and who should prescribe the antibiotics.

Tool III: Mother's Use Of Antibiotics Assessment Questionnaire: this tool was developed by the researchers after reviewing recent literature to assess the mother's use of antibiotics it included the following; the frequency of antibiotic consumption for the child, sources of antibiotic prescription, following the instruction on antibiotics labels, antibiotic using schedule/time, what about left-over antibiotics, precaution done when using antibiotics, reasons behind appropriate and inappropriate use of antibiotics, action taken if the improved/ didn't improved .

III. Methods

The study was conducted through the following phases;

Administrative process:

- An official letter was directed from the Faculty of Nursing to Directorate of Health Affairs in Alexandria to obtain an approval for collecting the necessary data from the selected settings.
- Approval letters directed from the Directorate of Health Affairs in Alexandria to directors of the selected primary health care settings.
- Meetings were held with directors of the selected primary health care settings to clarify the purpose of the study and to gain their cooperation during data collection.

Content validity:

After reviewing the recent literatures, the two tools were developed by the researchers. It was validated by juries of five experts in the field of community health nursing. Their suggestions and recommendations were taken into consideration.

Pilot study:

A pilot study was carried out on 40 mothers in order to ascertain the relevance, clarity and applicability of the tools, test wording of the questions and estimate the time required for filling the questionnaire. Based on the obtained results, the necessary modifications were done.

Field work:

- An interview was conducted with mothers of children under five years. Each mother was interviewed individually after brief explanation of the aim of the study using tool I and II.
- The interview took approximately 20-30 minutes for each mother.
- Data were collected by the researchers over a period of three months from June 2019 to September 2019.

Statistical analysis:

- The collected data were coded and analyzed using PC with the International Business Machine - Statistical Package for Social Sciences (IBM-SPSS version 25) and tabulated frequency and percentages were calculated.
- Descriptive statistics measures, which including number, percentages, and averages, measures of dispersion and central tendency (Minimum, Maximum, Arithmetic mean (\bar{x}), Standard deviation (SD)). Measures of association Chi-square test (X^2), Fisher Exact Test (FET).
- The level of significance selected for this study was p value equal to or less than 0.05.

Knowledge scoring system: -

Each item of the knowledge took either (two) for correct and complete response, (1) for correct incomplete response, or (zero) for incorrect or don't know. Then the score was summed and converted into percentage score as the following; the score $\geq 75\%$ was interpreted as good knowledge, the score 50 to $<75\%$ was interpreted as fair knowledge, and the score $<50\%$ was interpreted as poor knowledge.

Ethical considerations: -

- Informed written consent was obtained from all participants after providing an appropriate explanation about the purpose of the study and nature of the research. For illiterate mothers witness written consent was obtained.
- The confidentiality and anonymity of individual responses, volunteer participation and right to refuse participating in the study were emphasized to the participants.
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IV. Results

Table (1) A total of 400 eligible mothers contacted with the researchers at different primary health care centers were expressing their interest in being interviewed. About three quarters (73.5%) of them were living in urban areas and more than half (59.8%) of them aged less than 30 years, while those belonging to the age groups of 30-<40 constituted 35.8% with a mean of 29.0 ± 4.4 years. With respect to mothers' education, about two fifth (43.8%) of them were highly educated and nearly with the same percentage (40.3%) had secondary/associate degree. Regarding the mothers' work it was found that, more than three quarters (77.5%) of the mothers were not working (housewife). Table (1) also shows that, about half (53.3%) of those mothers were newly mothers with their first child.

The majority (94.2%) of the mothers had children aged less than three years, 69.5% out of 94.2% representing under the age of one year. Slightly more than half (52.3%) of mothers have female child. 57% out of the total mothers came to the centers with their children to make a follow up while the rest of mothers came to consult a health care professional with their ill child that suffered from Diarrhea, ARI, and jaundice (27.5%, 12.8%, 2.8% respectively). In relation to the family monthly income, it was found that more than half (67.8%) of the families' income was enough. 29.5% of them had insufficient income; the minority (2.8%) of them had enough and save income. In relation to family size, the total subjects' family size ranged from 3-6 members with a total mean 3.8 ± 0.9 member and majority (78.5%) of the families had 3-4 members/ family.

Table (1) Distribution of the Studied Mothers and Their Children According to Their Personal and Socio-demographic Characteristics

Personal & socio-demographic characteristics	No. (400)	%
Mother's age (Years)		
Less than 30	239	59.8
30 to less than 40	143	35.8
40 and more	18	4.5
$\bar{x} \pm SD$	29.0 \pm 4.4 years	
Place of residence		
Urban	294	73.5
Rural	33	8.3
Slums	73	18.3
Mother's education		
Illiterate	11	2.8
Primary	27	6.8
Preparatory	26	6.5
Secondary/ associate degree	161	40.3
University	175	43.8
Mother's work		
Non-working	310	77.5
Working	90	22.5
No of family member		
3-4 member	314	78.5
5-6 member	86	21.5
$\bar{x} \pm SD$	3.8 \pm 0.9 member	
Family income		
Enough	271	67.8
Not enough	118	29.5
Enough and save	11	2.8
$\bar{x} \pm SD$	1819.6 \pm 594.3 LE	
Child's age (months)		
Infant (0-1 year)	278	69.5
Toddler (1-3 years)	99	24.8

Personal & socio–demographic characteristics	No. (400)	%
Preschooler (3-5 years)	23	5.8
$\bar{x} \pm SD$	13.5±0.9 months	
Child's birth order		
First	213	53.3
Second	130	32.5
Third	31	7.8
Fourth	26	6.5
Child's Sex		
Male	191	47.8
Female	209	52.3
Reason for visiting health center/child complaints		
Follow-up	228	57.0
Diarrhea	110	27.5
Acute Respiratory tract Infection (ARI)	51	12.8
Jaundice	11	2.8

Table (2) This study results focused on the determinants of inappropriate use of antibiotics among mothers' of under five children, table (2) shows that, the majority of respondents (81.5%) had previously used antibiotics and slightly more than two thirds out of them (79.1%) used antibiotic frequently (from 2 to more than 5 times) during the past year. One in every two mothers (50%) used antibiotics for treating her child from common cold, while one in every three (35.3%) mothers treated child from sore throat while, 16.3% only gave the antibiotics to treat ear infection. Regarding duration of antibiotic use, more than one third (37.1%) of mothers used antibiotics for 5 days. While less than one tenth (8.9%) used antibiotics until finishing the package.

Concerning the antibiotic prescription, more than half (58.3%) of mothers follow the acceptable prescription as they had purchased antibiotics using their physician's prescription, while the rest of the mothers 38.7% follow unacceptable prescription by obtaining antibiotics directly from pharmacies according the advice of the pharmacists (92.6%),mothers' own previous experiences with their children(61%) . In addition, about one third (35.3%) of mothers reported that their family members and their mothers in law have a say to give this antibiotic to their children. Moreover, about one fifth (19.1%) of the mothers follow the advice from different social media groups to use and select antibiotic (unacceptable prescription) (**Figure 1**)

As for antibiotic use precautions that should be followed by mothers, majority of the mothers follow the antibiotic usage such as keep the antibiotic inside the refrigerator, on the other hand, more than one tenth (14.7%)of the mothers did not follow antibiotics instruction during preparation, did not give antibiotic on time (15.1%) or check its expire date(16.9%). About one third (33.1%) of mothers did not follow physician ordered dose, and about half (48.8%) did not consider the proper drug concentration

Regarding the mothers action after child improvement about two fifths(40.8%) of the mothers Complete the antibiotic dose as ordered while the rest of mothers either tried to stop the antibiotic as stated by one third of the subjects(34.9%) or to decrease the dose of antibiotic as reported by one quarter of mothers(24.2%). More than half (58.9%) of mothers got rid of the left-over antibiotics (remaining medicine) while the rest (41.1%) of mothers kept the antibiotics to reuse it again. While in case of no child improvement, majority (88.6%) of the mothers asked the physician again while the rest of mothers either tried to finish the antibiotic package (9.2%) or changed antibiotic by their own self (2.1%).

Table (2) Distribution of the Studied Mothers According to Their Determinant of Inappropriate Use of Antibiotics

Determinant of inappropriate use of antibiotics	No. (400)	%
Previous use of antibiotics		
No	74	18.5
Yes	326	81.5
Frequency of using antibiotics during the last 12months	n. (326)	
Once	107	32.8
Two to five times	172	52.8
More than 5 times	47	14.4
Reasons behind the previous use of antibiotics		
Common cold	164	50.3
Sore throat	115	35.3
Ear infection	53	16.3
Duration of antibiotic use		
3 days	85	26.1
5 days	121	37.1
7 days	91	27.9
Till finished the package	29	8.9

Determinant of inappropriate use of antibiotics	No. (400)	%
Antibiotics use precautions followed by mothers #		
Keep the antibiotic inside the refrigerator	322	98.8
Follow antibiotic use instruction during preparation	278	85.3
Give antibiotic on time	277	84.9
Check the expire date	271	83.1
Follow physician ordered dose	218	66.9
Consider the proper concentration	167	51.2
Mother's action after child improvement		
Complete the antibiotic dose as doctor order	133	40.8
Stop the antibiotic	114	34.9
Decrease the antibiotic dose	79	24.2
Mother's action with the left-over antibiotics (remaining medicine)		
Discard it	192	58.9
Kept it to give to another person (reuse)	134	41.1
Mothers' action if the child didn't improve		
Ask physician	289	88.6
Comply antibiotic till finished dose	30	9.2
Change antibiotic by own self	7	2.1
Who prescribe the antibiotic		
Acceptable prescription (Physician order)	190	58.3
Unacceptable prescription (without Physician order)	136	41.7
Who advice the mother to use antibiotic#		
Pharmacist	126	92.6
Self-prescription (Mother's own experience)	83	61.0
Grandmothers (Mother in law)	48	35.3
Social media	26	19.1
Reasons behind inappropriate use of antibiotics #		
Nearby pharmacy	111	81.6
Low income to pay physician fees (inability to pay physician fees)	57	41.9
Mothers' previous self-experience with antibiotic outcome	57	41.9
Availability of left-over antibiotic	31	22.8
Far Health center (health center related reasons)	31	22.8
Lack of medicine at the health center (health center related reasons)	26	19.1
Occurrence of complication after inappropriate use of antibiotics		
None	22	16.2
Diarrhea	79	58.1
Constipation	15	11.0
Vomiting	11	8.1
Colic	9	6.6

Multiple response

In addition, **figure (1)** shows the Unacceptable Antibiotic Prescription and related occurrence of after use complications as majority (81.6%) of the mothers stated that, presence of nearby pharmacy was the main reasons behind their antibiotic inappropriate/unacceptable prescription followed by their previous experience with the antibiotic outcome(41.9%), low income to pay the physician fees(41.9%), availability of left-over antibiotics (22.8%) and finally reasons related to the health centers as far health center (22.8%) and unavailability of antibiotics at the health centers(19.1%) (every time I go there is no antibiotic I buy it outside so why I visit it I repeat the antibiotic myself)as shown in table(2) and (figure 1). Finally, the majority of the mothers (83.8%) stated a lot of complications that may be occurred after unacceptable prescription of antibiotics these complications were mainly related to Gastro-intestinal tract as diarrhea (58.1%), constipation (11%), vomiting (8.1%) and colic (6.6%).

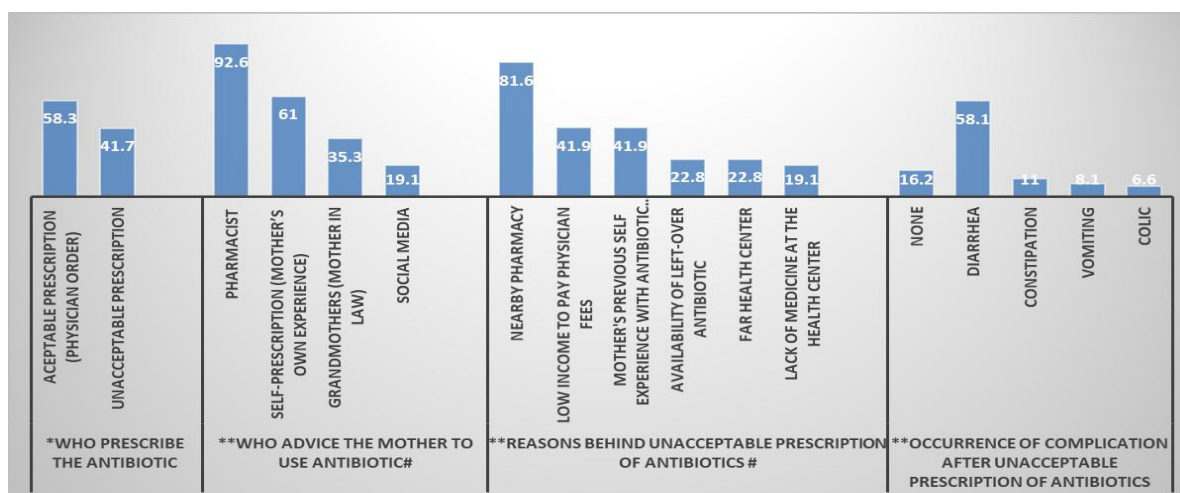


Figure (1): Unacceptable Antibiotic Prescription and Related Occurrence of After Use Complications

** Appropriate/Acceptable prescription (If the medicine is prescribed by physician only), inappropriate / unacceptable prescription (If the medicine is prescribed by anyone other than the physician) *n.=326 ** n.=136 #Multiple response

The level of knowledge about the use, effectiveness, resistance and safety of antibiotics was evaluated using statements shown in (Table 3). Regarding the mothers knowledge related to the use of antibiotic, only 7.2% of the mothers agreed correctly that antibiotics are effective only against bacteria, whereas, 39.8% of mothers incorrectly agreed that antibiotics are effective against all types of microorganisms including viral and fungal infections.

It is worth noting that, more than half (53.3%) of the mothers incorrectly agreed and believed that antibiotics were the same as antipyretic drugs used to decrease fever or treating cough. Slightly more than half (54.8) agreed correctly that, the inappropriate use of antibiotic may lead to deterioration in child immunity, while about one third (34%) of the mothers did not know the correct answer. Concerning the usefulness of all kinds of antibiotics to treat all types of infection, more than half of the mothers either agreed incorrectly or did not know the correct answer (22.5%, 32% respectively).

Three out of four mothers (77.8%) agreed correctly that antibiotics must be used after physician prescription and only 14% agreed correctly that overuse of antibiotics will decrease the immunity within the community. More than half (55.3%) of the mothers did not know if the antibiotics must be kept as a stock at home or not in addition, about one tenth (11.5%) of them agreed incorrectly to use antibiotics as prophylaxis to prevent diseases.

In fact, majority (88.5%) of mothers agreed correctly that child's vaccination will limit unnecessary use of antibiotics; however, 80.3% of the mothers were unaware that excessive use of detergents could be harmful and will increase the occurrence of infection. Furthermore, table (3) shows, the total knowledge Mean score for the mothers which is 5.0 ± 1.7 out of 10 with a total knowledge Mean percent score 50.3 ± 17.2 out of 100%, that means more than half (56.5%) of mothers had poor knowledge regarding use of antibiotics and only 6% had good knowledge while slightly more than one third (37.5%) had fair knowledge.

Table (3) Distribution of The Studied Mothers According to Their Knowledge Regarding Antibiotic Use

Mother's knowledge regarding antibiotic use	No. (400)	%
Reasons to use antibiotics		
Don't know	83	20.8
To treat viral infection	117	29.3
To treat bacterial infection *	29	7.2
To treat fungal infection	12	3.0
To treat all types of microorganism (bacterial, fungal, viral, etc..)	159	39.8
Every child suffers from fever and or cough must be treated by antibiotics		
Don't know	136	34.0
Yes	213	53.3
No*	51	12.8
Inappropriate use of antibiotic may leads to		
Don't know	115	28.7
Early improvement	66	16.5
Deteriorate the immunity*	219	54.8
All antibiotics are useful to treat all types of infection		
Don't know	128	32.0

Mother's knowledge regarding antibiotic use	No. (400)	%
Yes	90	22.5
No*	182	45.5
Antibiotics must be used after prescription		
Don't know	78	19.5
Yes*	311	77.8
No	11	2.8
Overuse of antibiotics may lead to decrease the herd immunity (State of the immunity within the community)		
Don't know	94	23.5
Yes*	56	14.0
No	250	62.5
Antibiotics must be kept as stock at home		
Don't know	221	55.3
No*	170	42.5
Yes	9	2.3
Antibiotics must be used of to prevent diseases		
No*	354	88.5
Yes	46	11.5
Child's vaccination limit unnecessary use of antibiotics		
No	31	7.8
Yes*	369	92.3
Excessive use of detergents is useful to decrease the occurrence of infection		
No*	79	19.8
Yes	321	80.3
Total Knowledge score		
Total knowledge \bar{x} score \pm SD (Maximum allowed score is 10)	5.0 \pm 1.7	
Min-Max	2-8	
Total knowledge \bar{x} score % \pm SD (Maximum allowed score is 100)	50.3 \pm 17.2	
Min-Max	20-80	
Total knowledge score classifications		
Poor	226	56.5
Fair	150	37.5
Good	24	6.0

* Proper correct answers

Table 4 shows that, certain variables such as child age, child's birth order, family income, place of residence, mothers' age, mothers' educational level, mothers knowledge had significantly associated with the mothers' use of antibiotics (FET= 11.999, P=0.002, FET =15.495, P=0.001, FET=30.023 P=<0.001, X²::11.168 P:0.004, FET:26.461 P:<0.001, FET:17.773, P:0.001, X²: 34.245, P <0.001). However, the child sex, the mother working status had insignificantly associated with use of antibiotic (X²=2.667, P:0.102, X²= 0.173 P:0.677)

Table (4) The Association between Certain Variables and The Studied Mothers Previous Use of Antibiotics

Variables	Previous use of antibiotic				Test of significance
	Non-users		Users		
	No.	%	No.	%	
Child's age (months)					
Infant (0-1 year)	63	22.7	215	77.3	FET:11.999 P:0.002*
Toddler (1-3 years)	11	11.1	88	88.9	
Preschooler (3-5 years)	0	0.0	23	100.0	
Child's Birth order					
First	53	24.9	160	75.1	FET:15.495 P:0.001*
Second	17	13.1	113	86.9	
Third	0	0.0	31	100.0	
Fourth	4	15.4	22	84.6	
Child's Sex					
Male	29	15.2	162	84.8	X ² : 2.667 P:0.102
Female	45	21.5	164	78.5	
Family income					
Enough	70	25.8	201	74.2	FET:30.023 P:<0.001*
Not enough	4	3.4	114	96.6	
Enough and save	0	0.0	11	100.0	
Place of residence					
Urban	43	14.6	251	85.4	X ² :11.168

Variables	Previous use of antibiotic				Test of significance
	Non-users		Users		
	No.	%	No.	%	
Rural	9	27.3	24	72.7	P:0.004*
Slums	22	30.1	51	69.9	
Mother's age (Years)					
Less than 30	29	12.1	210	87.9	FET:26.461 P:<0.001*
30 to less than 40	45	31.5	98	68.5	
40 and more	0	0.0	18	100.0	
Mother's education					
Illiterate	0	0.0	11	100.0	FET:17.773 P:0.001*
Primary	0	0.0	27	100.0	
Preparatory	0	0.0	26	100.0	
Secondary/ associate degree	33	20.5	128	79.5	
University	41	23.4	134	76.6	
Mother's work					
Non-working	56	18.1	254	81.9	X ² :0.173
Working	18	20.0	72	80.0	P:0.677
Mother's knowledge					
Poor	55	24.3	171	75.7	X ² :34.245 P:<0.001*
Fair	8	5.3	142	94.7	
Good	11	45.8	13	54.2	

X²: Chi-square test

P: p value of test of significance

FET: Fisher Exact Test

*: Significance at p value ≤0.05

Table 5 shows significant associations between certain variables such as family income, place of residence, mothers' age, mothers' educational level, and mothers knowledge with the type of antibiotic prescriptions (acceptable and unacceptable prescription) (X²:34.972, P:<0.001, X²:39.788 P:<0.001, X²:12.429, P:0.002, X²:24.875, P:<0.001, X²:21.147, P:<0.001) However, the same table shows that there is no significant association between child age, child's' birth order, the child sex, the mother working status with the type of antibiotic prescriptions (acceptable and unacceptable prescription) (X²:0.128 P:0.948, X²: 4.850, P:0.182, X²:0.337 P:0.562, X²:1.152 P:0.283)

Table (5) The Association between Certain Variables and Mothers' Antibiotic Prescription Type

Variables	# Antibiotic prescription types n. 326				Test of significance
	Non-acceptable prescription n.136		Acceptable prescription n.190		
	No.	%	No.	%	
Child's age (months)					
Infant (0-1 year)	91	42.3	124	57.7	X ² :0.128 P:0.948
Toddler (1-3 years)	36	40.9	52	59.1	
Preschooler (3-5 years)	9	39.1	14	60.9	
Child's Birth order					
First	60	37.5	100	62.5	X ² : 4.850 P:0.182
Second	47	41.6	66	58.4	
Third	17	54.8	14	45.2	
Fourth	12	54.5	10	45.5	
Child's Sex					
Male	65	40.1	97	59.9	X ² :0.337 P:0.562
Female	71	43.3	93	56.7	
Family income					
Enough	65	32.3	136	67.7	X ² :34.972 P:<0.001*
Not enough	71	62.3	43	37.7	
Enough and save	0	0.0	11	100.0	
Place of residence					
Urban	87	34.7	164	65.3	X ² :39.788 P:<0.001*
Rural	24	100.0	0	0.0	
Slums	25	49.0	26	51.0	
Mother's age (Years)					
Less than 30	93	44.3	117	55.7	X ² :12.429 P:0.002*
30 to less than 40	30	30.6	68	69.4	
40 and more	13	72.2	5	27.8	
Mother's education					
Illiterate	0	0.0	11	100.0	X ² :24.875 P:<0.001*
Primary	17	63.0	10	37.0	
Preparatory	16	61.5	10	38.5	
Secondary/ associate degree	61	47.7	67	52.3	

Variables	# Antibiotic prescription types n. 326				Test of significance
	Non-acceptable prescription n.136		Acceptable prescription n.190		
	No.	%	No.	%	
University	42	31.3	92	68.7	
Mother's work					
Non-working	102	40.2	152	59.8	X ² :1.152 P:0.283
Working	34	47.2	38	52.8	
Mother's knowledge					
Poor	89	52.0	82	48.0	X ² :21.147 P:<0.001*
Fair	47	33.1	95	66.9	
Good	0	0.0	13	100.0	

X²: Chi-square test

P: p value of test of significance

*: Significance at p value ≤0.05

V. Discussion

Antibiotics have been displayed in certain communities, as “The magic that treat everything”. The unregulated access and misuse of antibiotic is generally recognized and considered one serious phenomenon that exists among mothers in developing countries (Abu Romman,2013). According to WHO 2014, bacterial resistance to antibiotics is frequently reported in these countries. But the practice of how the mothers use antibiotics still remains unknown. In Egypt the Knowledge regarding antibiotic therapy issues especially how these antibiotics are dispensed (professional prescription or self-medication) among the Egyptian mothers has only been studied to a limited extent (WHO,2014) Thus, this cross sectional study aimed to identify the determinants of antibiotics misuse among under five mothers in Alexandria Governorate Egypt. The Prevalence of antibiotic use in this study is widespread among under five children as reported by 81.5 % of their mothers. Mothers used antibiotics in the last year with highest percentage than what was reported by a survey across 12 countries 65%. (Hassan et al, 2011)

In fact, the relationship between socio-demographic characteristics and antibiotic misuse cannot be overlooked; hence this study results have focused on these important determinates of antibiotic misuse such as age, education, income levels and geographical locations. Mothers’ age had been associated with antibiotics misuse as elder mothers (40 years and more) were much more depending on their experience to give antibiotics to their children without doctor prescription (unacceptable prescription) than younger ones (30 years and less). This was supported by the mothers’ statements "When I give my child this antibiotic, all the symptoms disappear (sore throat and fever) I tried it before several time”. Moreover elder mothers (more than 40 years) may have more children. Having more children has showed to be associated significantly with antibiotic misuse in Greece. (Mitsi, 2005) and this study findings showed somewhat similar association. Depending on personal experience or other experience in antibiotics was a contributor for the determination of the type of antibiotic to be used for children. Such conviction indicates that elder mothers depend on history of dealing with antibiotic to draw their future attitudes. On the other hand, younger mothers lack the experience of using antibiotics to lesser extent than elder mothers as they afraid of giving any antibiotics to their first child. For example one mother reported that “*I’m afraid to give any medications to my child and I prefer to go to doctors first.*” This study results supported Kingdom of Saudi Arabia (KSA) study.(Aleem, 2016) which recommended that, the excessive use of antibiotics by mothers must be deduced by giving priority to knowledge-based education programs especially for younger generation.

Education is another important determinant for antibiotic misuse among mothers, this study results’ highlighted that, low level of mothers’ education is significantly associated with antibiotic use and with unacceptable antibiotic description comparing to mothers with high educational level. The sad finding in this study is that, all illiterate mothers did not follow acceptable prescription of antibiotics for their children, they lacked information regarding when and how to use this antibiotic. Moreover, low level of education also were associated with misuse in Syria (Barah et al, 2010)) that reported highest level of misuse (57%).

In this respect, less educated mothers depend on their memory and experience to give the child the medication. Depending on the memory may expose the child to get wrong medication as well. “*I purchase the medication which has a child and girl picture with strawberry tasting I used it several times*” one mother said. Taha et al. (2014) also had found that some less educated mothers choose antibiotic according to the color and shape thus, urgent integrated health awareness messages about the threat of antibiotic resistance and the importance of prudent antibiotic use with the literacy classes is warrant for changing the mothers’ knowledge On the other hand, a recent study in KSA,2019 has found that, the parents’ knowledge attitude and practice with respect to antibiotic use for their children are poor especially among well educated parents.(Al-Ayed, 2019)

Concerning to the family income, however, near equal percentage of both mothers with high and low income had higher level to use antibiotic (100%, 96.6% respectively), and Three out of four mothers (77.8%) agreed correctly that antibiotics must be used after physician prescription, there is a significant association between low income and antibiotic misuse and between low income and unacceptable description of the

antibiotic as more than half of low income mothers were unable to pay physician fees and they have also no money to pay for far health centers transportation. Some mothers raised an important issue which is *"Lacking of medicine at the health center"* this issue give the mother a reason to not visit the health centers as a result of lacking of free antibiotics and other medications and finally they will purchase the antibiotic from the pharmacy by themselves. *"I have no enough money to go to physician several times: I pay for the physician, transportations, and medications I can't afford all of that"*. Said one mother, another mother added *"It is useless to go to the health center, they give no medication and finally I will buy it from any pharmacy. I will repeat it myself"*. Health insurance affordability with provision of essential medications especially for poor mothers could be associated with low antibiotic misuse. Whereas, in previous studies in Jordan self medication prevails as income increases and with a high level of education .(Sawair et al., 2009; Al-Azzamet al., 2007)

The result of the present study was in agreement with previous studies; that showed that, the parents who belong to sound social and financial sector and also have higher education, can afford to go to the health care providers for consultation and proper treatment but they believe in the usage of antibiotics more than those who belong to poor and un-educated class. They do so despite the fact that they very well know and better understand the disadvantages of misuse of antibiotics which lead to harmful effects and casual bacterial resistance.

It is worth mentioning that, place of residence especially residence in rural and squatters areas where was significantly associated with unacceptable antibiotic prescription comparing to urban areas. This can be related to that the urban people are mostly literate, are able to easily get access to the mass media, and possibly have received more information about antibiotics than those in rural and squatter areas where . poverty and low education level is prevailing.

The influence of community culture and the social media certainly considered an important determinant that playing a significant role in mothers' knowledge and practices related to antibiotic misuse. This study results showed that, despite of more than half (58.3%) of mothers placed their high trust in physician prescription, in line with Previous studies.(You et al,2008; Lowman et al, 2010),41.7% of them follow unacceptable prescription by obtaining antibiotics directly from pharmacies as they follow the advice of their family members especially their mothers and their mothers in law. Mothers trust in giving antibiotics to their children for the desire to get better as they know it from her mother's supporting the culture of giving antibiotic. *"My mother in law always told me that antibiotic is the best and very fast to treat children"* stated one mother. The main influence to give antibiotic may be linked with community believes that the best (fastest, most complete) response is achieved with help from antibiotics. Social media groups also play a role to guide mothers to use antibiotic this also reported by, Zucuo et al., 2018.

Across the 12 countries survey 25% of respondents included in the survey thought that, it is acceptable to use antibiotics that were given to a friend or family member, as long as they were used to treat the same illness; 43% think it is acceptable to buy the same antibiotics, or request these from a doctor, if they are sick and antibiotics helped them get better when they had the same symptoms before. Both these actions can result in improper use of antibiotics, and therefore contribute to the resistance problem.(WHO,2015)

Concerning the mothers' level of knowledge regarding antibiotics use, this study found that, more than half (56.5%) of the mothers had poor knowledge and bad believes regarding antibiotic use which in turn contribute to bad practice and misuse of antibiotics. This level of knowledge is lower than what was reported in previous study since 2014 at rural areas in Al Gharbia governorate Egypt (82.4%) (Khaton,2014). Mothers at this study did not know that, antibiotic should be used for a certain period of time not when the child begin to improve. Another issue lies in understanding the antibiotic indication: only 7.2% understood that antibiotics are used to treat bacterial infection, while the remaining respondents had mixed answers and believed for its use in viral infections too. (Taha et al.,2014) This confusion among the mothers regarding whether antibiotics are effective against bacteria and viruses was argued that many people do not understand the differences between bacteria and viruses and believed that antibiotics work against both. In line with these findings, it has been previously reported in two community-based studies in developing countries that less than 40% of participants believed that antibiotics are effective against bacteria, while 6.9% and 48.1% incorrectly believed that antibiotics are effective against viruses .(Napolitano ,2013; El Zowalaty et al,2016). It is surprising to note that, more than half (53.3%) of the mothers incorrectly agreed and believed that antibiotics were the same as antipyretic drugs used to decrease fever or treating cough in line with this results Abu Romman's, study in Jordan (2013) found that, Parents believe that antibiotic is the only treatment that can be used for various diseases. They believe that antibiotic is a proper treatment for fever, viral infections, and some parents believe that antibiotic is necessary in any of the previous cases. .

Moreover, mothers did not know also if the antibiotics must be kept as a stock at home or not. In addition, they also agreed incorrectly to use antibiotics as prophylaxis to prevent diseases. That's why a lot of mothers tried to keep antibiotics at their homes to reuse it again. Some parents fear of infection and they believe

in antibiotic power to prevent infection so they gave their children antibiotic once per month or more. These results indicate high misuse of antibiotics. Al-Ayed in his study (2019) in various cities in KSA found that, (66%) parents had stored antibiotics for future use, while 50% reported that they did not receive any advice from their doctor toward the use of antibiotics.

In fact mothers' misconception and misbehavior regarding the storage of antibiotics for long time or not completing the antibiotic course for their children and reserving it for future use. They were found to be less knowledgeable enough to deal with suspension antibiotics as they did not realize that when an antibiotic is suspended its validity for use. However, majority of (98.8) this study subject indicated correct procedure for the reservation of antibiotic, but the antibiotic reserved is not used properly, because antibiotic should be used completely by the child as a treatment course, or suspending antibiotic will alter its maximum period of use. A focus should be directed to another issue that need more study and investigation among the Egyptian mothers which is the excessive use of detergents especially that 80.3% of the mothers were unaware of over and haphazard use of detergents

The determinants of Antibiotic misuse among mothers' of under five children are evidently associated with the mothers' misconception as well as their poor practice regarding use of these antibiotics. In Egypt, antibiotics can be purchased from the pharmacy without prescription (unacceptable prescription); and that's why 41.7% of this study mothers use antibiotic without prescription and without guidance to their related practices. This rate is higher than reported from UAE (36%)(Abasaed,2009), Jordan (39.5%)(Al-Azzam,2007) Greece (22.70%)(Mitsi, 2005) Saudi Arabia (16.1%)(Aleem ,2016), USA (12% in sub urban area)(Edwards,2002), Hong Kong (9%)(You, 2008), and UK (5%)(McNulty,2007). However, this rate is lower than reported from Syria(57%)(Barah,2010) This difference in results may be attributable to the difference in public awareness, different cultures, and health system.

Assessing mothers' practices as an important determinant of misuse antibiotic is another aim of this study. Despite of 54.8% of the mothers realized that excessive and irrational use of antibiotic may deteriorate person immunity; majority of them had poor practices when dealing with antibiotics. For example mothers give their children antibiotics by themselves in case of common cold and sore throat (irrational cause), and about half of them did not follow use precaution in the form of not considering the medication concentration and time schedule for antibiotic (prescribed duration by doctors). Not only these previous poor practices but also they stop the antibiotic by themselves if they felt their children condition improved, and they stored the antibiotic for reuse by the family members (left over). In line with this respect, across the 12 countries survey in 2015, 32% of respondents tried to stop taking antibiotics when they feel better, not when they have taken all of them as directed. Respondents in Sudan, Egypt and China were particularly likely to state that, they should stop taking antibiotics when they feel better, with 62%, 55% and 53% of survey participants respectively choosing this response.(Antibiotic Resistance: Multi-country public awareness survey. WHO, 2015). While in india,2015, 85.2% parents said that they never used leftover antibiotics from the previous prescription for their child. (Agarwal et al, 2015)

Finally speaking, antimicrobial resistance is a global threat that requires actions focusing on the origins of antimicrobial resistance. Inappropriate antibiotic use is one of the main factors that determined speedy development of antibiotic resistance. Incorrect prescribing of antimicrobials and antibiotics availability over the counter and self-medication shows that society is lacking general awareness about antimicrobial resistance.(Naveed et al,2015). The sad fact in this study results that, mothers themselves play a role behind the occurrence and the prevalence of antibiotic resistance. Firstly, some mothers don't seek advice from any of the health care professional when they purchase antibiotic. Moreover, mothers also stop giving the medication or decrease the dose by their own self just as a reaction to their child symptoms improvements.(Al-Ayed,2019) Secondly by giving left over antibiotics to reuse it again by any family members as reported by 41% of mothers. Failure in finishing the whole course of prescribed antibiotics or not following the complete course of antibiotics can result in need to restart the treatment later and cause the spread of antibiotic-resistant substances among harmful bacteria. A large systemic review from various regions and countries; had reporting a mean compliance with antibiotic treatment of 60.2%, and use of left over antibiotics of 28.6%. (Przemyslaw et al.,2005)In another words "The compliance with antibiotic administration will prevent antimicrobial resistance. Thus compliance with antibiotic administration is another important determinant that should be investigated when looking for antibiotic misuse"

VI. Conclusion

Based on the findings of the current study, it can be concluded that:

The determinants of antibiotics misuse by the studied mothers in children under five years include mother's self-experience, mother in law experiences (family related reasons), pharmacist prescription of antibiotics with no limitation to doctor orders, far health centers and lack of medication at the centers (health center related reasons), low income or inability to pay physician fees (economic reasons), availability of left-

over antibiotic, the mother incompliance with antibiotic administration and effect of social media that give the mother incorrect guidance.

The total knowledge mean percent score for the mothers was 50.3 ± 17.2 out of 100%, that means more than half (56.5%) of mothers had poor knowledge regarding use of antibiotics and only 6% had good knowledge while slightly more than one third (37.5%) had fair knowledge.

VII. Recommendations

Based on the previous findings, the following recommendations are suggested:

- Emphasize on the importance of rising public awareness regarding antibiotic misuse and its related consequences through educational sessions or educational campaigns and distribute healthy messages about the appropriate usage of antibiotics and the issue of bacterial resistance.
- Concerning antibiotics usage precautions, younger generation mothers as well as illiterate mothers need to be educated and counseled to take antibiotics exactly as prescribed. Moreover, there is a need for the cooperation between Ministry of Health and Population (MOHP) representing with health care providers and the different health care settings and Ministry of Social Solidarity (MOSS) representing with Nongovernmental Organizations (NGOs) and the national illiteracy program, and Ministry of Education (MOE) representing by school teachers, students and their parents to enhance the knowledge of the parents regarding the inappropriate use of antibiotics.
- Media directed recommendations including (1) Establishing adult educational programs using all media means about; the illnesses that require antibiotic therapy and emphasizing when antibiotics will not do any good, (2) Controlling channels of obtaining antibiotics by implementing strict drug regulations.
- Enforcement of drug regulations in Egypt that raise inappropriate antibiotics consumption. Health authorities have to implement their regulations to enhance the selling of Prescription Only Medicine (POM) and prohibit selling medicine without prescription. emphasizing pharmacist's role and responsibility in stopping antibiotic sale without prescription
- Encourage and enforce affordability of Health insurance coverage with provision of essential medications especially for poor mothers
- Further study is needed to investigate the Egyptian mothers' perception regarding excessive use of detergents especially that 80.3% of study subjects were unaware of the overuse haphazard of detergents.

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Conflict of interest

The authors declared that they have no conflict of interest.

Author contribution

All three authors were part of the initial design of the research. They shared in collected and analyzed the data, wrote and edited the final version of the text of the manuscript and formatted it and submitted it for publication.

References

- [1] Abasaed, A Vlcek J, Abuelkhair M, Kubena A. Self Medication with antibiotics by the community of Abu Dhabi Emirates, United Arab Emirates. *J Infect Dev Ctries.* 2009; 3; 491-97
- [2] Abu Romman H. (2013). Pattern of antibiotic use among children *Int. J. Med. Med. Sci* 5(6), pp. 264-272.
- [3] Agarwal S, Yewale V, Dharmapalan D. (2015). Antibiotics Use and Misuse in Children: A Knowledge, Attitude and Practice Survey of Parents in India. *Journal of Clinical and Diagnostic Research*, Vol-9(11): SC21-SC24
- [4] Al-Ayed M S.(2019) Parents' Knowledge, Attitudes and Practices on Antibiotic Use by Children *Saudi Journal of Medicine & Medical Sciences*;7(2) Retrieved on November, 2019. Available at <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6503695/>
- [5] Al-Azzam, S.I., Al-Husein, B.A., Alzoubi, F., Masadeh, M.M., Al-Horani, M.S., (2007). Self-medication with antibiotics in Jordanian population. *Int. J. Occup. Med. Environ. Health* 4, 373–380.
- [6] Andermann A. (2016). Taking action on the social determinants of health in clinical practice: a framework for health professionals. *CMAJ.* 2016 Dec 6; 188(17-18): E474–E483. doi: 10.1503/cmaj.160177
- [7] Aleem M, Rahman M, Ishfaq M, Mehmood K, Ahmed S. (2016). Determinants of Antibiotics Misuse by the Parents in Children: A Survey From Northern Region of Saudi Arabia *Bangladesh J Child Health* 2016; VOL 40 (2) : 64-71
- [8] Atif M, Sadeeqa S, Afzal H, Latif S. (2018). Knowledge, Attitude and Practices regarding Antibiotics Use among Parents for their Children. *International Journal Of Pharmaceutical Sciences And Research*, Vol. 9(5): 2140-2148. DOI: 10.13040/IJPSR.0975-8232.9(5).2140-48
- [9] Barah F, Goncalves V. Antibiotic use and knowledge in the community in kalamoon, Syrian Arab Republic; a cross-sectional study. *East Mediterr Health J.* 2010; 16; 516-21

- [10] Barker AK, Brown K , Ahsan M, Sengupta S, Safdar N. (2017). What drives inappropriate antibiotic dispensing? A mixed-methods study of pharmacy employee perspectives in Haryana, India. *BMJ Open*. 2017 Mar 2;7(3):e013190. doi: 10.1136/bmjopen-2016-013190.
- [11] Bryce A, Costelloe C, Wootton M, Butler C, Hay A (2018). Comparison of risk factors for, and prevalence of, antibiotic resistance in contaminating and pathogenic urinary *Escherichia coli* in children in primary care: prospective cohort study. *J Antimicrob Chemother*. 2018 May 1;73(5):1359-1367. doi: 10.1093/jac/dkx525.
- [12] CDC. (2019). The AMR Challenge. Retrieved on November, 2019. Available at: <https://www.cdc.gov/drugresistance/intl-activities/amr-challenge.html>
- [13] Diminskyte A. (2016). Antimicrobial resistance and the nurse's role. Degree program thesis, Arcada Department of Health and Welfare; Arcada University.
- [14] Edwards DJ, Richman PB, Bardley k, Eskin B, Mandell M. Parental use and misuse of antibiotics; are there differences in urban us. Suburban settings? *Acad Emerg Med*. 2002;9: 22-26
- [15] Elong Ekambi G-A, Okalla Ebongue C, Penda IC, Nnanga Nga E, Mpondo Mpondo E, Eboumbou Moukoko CE (2019) Knowledge, practices and attitudes on antibiotics use in Cameroon: Self-medication and prescription survey among children, adolescents and adults in private pharmacies. *PLoS ONE* 14(2): e0212875. <https://doi.org/10.1371/journal.pone.0212875>.
- [16] El Zowalaty ME, Belkina T, Bahashwan SA, El Zowalaty AE, Tebbens JD, Abdel-Salam HA, et al. Knowledge, awareness, and attitudes toward antibiotic use and antimicrobial resistance among Saudi population. *Int J Clin Pharm*. 2016;38(5):1261–1268. 10.1007/s11096-016-0362-x [PubMed] [CrossRef][Google Scholar]
- [17] Hassan A, Ibrahim, O & Guinaidy M. (2011). Surveillance of antibiotic use and resistance in Orthopaedic Department in an Egyptian University Hospital. *International Journal of Infection Control*. 7. 10.3396/ijic.v7i1.006.11.
- [18] Khaton,S (2014). Knowledge, Believes, and Practices regarding Antibiotic Use and Misuse among Rural Mothers in Gharbia Governorate. *International Journal of Current Research*. 6. 7109-7116
- [19] Lowman N, Bowden RG. Parental factors associated with injudicious antibiotic-seeking behavior. *Am J Health Behav*. 2010; 34: 633-40.
- [20] McNulty C, Boyle P, Nichols T, Clappison P and Davey P.: Don't wear me out- the public's knowledge of and attitudes to antibiotics use. *E Journal of Antimicrobial Chemotherapy*, 2007; 59: 727-738.
- [21] Mitsi G, Jelastopulu E, Basiaris H, Skoutelis A, Gogos C. Patterns of antibiotic use among adults and parents in the community: a questionnaire-based survey in a Greek urban population. *Int J Antimicrob Agents* 2005; 25: 439-443.
- [22] Napolitano F, Izzo MT, Di Giuseppe G, Angelillo IF (2013) Public knowledge, attitudes, and experience regarding the use of antibiotics in Italy. *PLoS One* 8: e84177. pmid:24376793
- [23] Naveed S, Qamar F, Maqsood A, Ayub A, Kauser H, Malik H, Hameed A. (2015). Prevalence and Consequences of Misuse of Antibiotics, Survey Based Study in Karachi 2015. *Journal of Bioequivalent and Bioavailability*, 2015, 7:5
- [24] Padget M, Tamarelle J, Herindraine P, Ndir A, Diene Sarr F, Richard V, Piola P, Guillemot D, Delarocque-Astagneau E. (2017). A community survey of antibiotic consumption among children in Madagascar and Senegal: the importance of healthcare access and care quality. *J Antimicrob Chemother* 2017; 72: 564–573
- [25] Przemyslaw K, Scott D & Golembesky A & Craig R. (2005). A systematic review and meta-analysis of misuse of antibiotic therapies in the community. *International journal of antimicrobial agents*. 26. 106-13. 10.1016/j.ijantimicag.2005.04.017
- [26] Sawair, F.A., Shayyab, M.H., Al-Rabab'ah, M.A., Saku, T., 2009.Prevalence and clinical characteristics of tori and jaw exostoses in a teaching hospital in Jordan. *Saudi Med. J*. 30, 1557–1562
- [27] Taha BA , Hama K H, Ismail BI, Mawlud SA. (2014). Assessment of Antibiotics Misuse among People in Erbil City kufa journal for nursing sciences vol.4 no. 3
- [28] Torres N, Solomon V, Middleton L. (2019). Patterns of self-medication with antibiotics in Maputo City: a qualitative study. *Antimicrob Resist Infect Control*. 2019; 8: 161. doi: 10.1186/s13756-019-0618-z
- [29] Urke H. 2017. Child health and childcare of very young children in Bolivia Colombia and Peru. Doctorate dissertation, University of Bergen.
- [30] Ventola C. (2015). The Antibiotic Resistance Crisis. *Pharmacy and Therapeutic Journal*; 40(4): 277–283.
- [31] WHO. (2001).WHO Global Strategy for Containment of Antimicrobial Resistance. WHO press: Switzerland, 2001.
- [32] WHO.2014.Antibiotic resistance: Global report on surveillance. Retrieved on November, 2019 Available at: https://apps.who.int/iris/bitstream/10665/112642/1/9789241564748_eng.pdf
- [33] WHO.2015. Antibiotic Resistance: Multi-country public awareness survey. Retrieved on November, 2019 Available at: <http://apps.who.int/medicinedocs/documents/s22245en/s22245en.pdf>
- [34] WHO. 2017. Causes of child mortality. Retrieved on November, 2019. Available at: https://www.who.int/gho/child_health/mortality/causes/en/
- [35] WHO. 2018a. Under-five mortality Situation. Global Health Observatory (GHO) data. Retrieved on November, 2019. Available at: https://www.who.int/gho/child_health/mortality/mortality_under_five_text/en/
- [36] WHO. 2018b. Change Can't Wait. Our Time with Antibiotics is Running Out. Retrieved on June, 2019. Available at: <https://www.who.int/campaigns/world-antibiotic-awareness-week/world-antibiotic-awareness-week-2018>
- [37] WHO. 2019a. World Antibiotic Awareness Week Retrieved on November, 2019. Available at: <https://www.who.int/campaigns/world-antibiotic-awareness-week>
- [38] WHO. (2019b). NO TIME TO WAIT: SECURING THE FUTURE FROM DRUG-RESISTANT INFECTIONS REPORT TO THE SECRETARY-GENERAL OF THE UNITED NATIONS APRIL 2019. WHO Publishing co: WHO press.
- [39] You, J.H., Yau, B., Choi, K.C., Chau, C.T.S., Huang, Q.R., Lee, S.S., 2008. Adult knowledge, attitudes and behavior on antibiotic use: a telephone survey in Hong Kong. *Infection* 36, 153–157
- [40] Zahreddine L, Hallit S, Shakaroun S, Al-Hajje A, Awada S, Lahoud N. (2018). Knowledge of pharmacists and parents towards antibiotic use in pediatrics: a cross-sectional study in Lebanon. *Pharmacy Practice Journal*;16(3):1194.
- [41] Zucco R, Lavano F, Anfosso R, Bianco A, Pileggi C, Pavia M. Internet and social media use for antibiotic-related information seeking: Findings from a survey among adult population in Italy. *Int J Med Inform*. 2018;111:131–139.

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