Original Article

Adherence of Family Physicians to Antibiotic Prescription Guidelines for Children Under Five Years in Alexandria

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Abstract

Background: Antibiotic use has been beneficial and, when prescribed and taken correctly, their value in patient care is enormous. Over prescription and abuse of antibiotics in the treatment is a worldwide problem. More than 40% of children with acute diarrhea receive unnecessary antibiotics and up to 60% of children with acute upper respiratory tract infections receive antibiotics inappropriately.
Objectives: To assess adherence of family physicians to guidelines for antibiotic prescription in acute upper respiratory tract infections and diarrhea in children under 5 years.
Methods: A cross-sectional study was conducted in 4 randomly selected family health facilities in Alexandria governorate. An observation checklist was designed based on Integrated Management of Childhood Illness (IMCI) guidelines and used on a sample of 300 consultation sessions.
Results: The study revealed that antibiotics were prescribed in 49.7% of the observed sessions and prescribed appropriately in 55.4% of the sessions according to IMCI guidelines. The type of prescribed antibiotic was appropriate in 91.8% of the sessions.
Conclusion: Family physicians' antibiotics prescription is inappropriate in nearly half of the studied children.

Keywords: Antibiotics, adherence, family physicians, under 5 children

INTRODUCTION

Antibiotics and similar drugs called antimicrobial agents, have been used since the 1940s. These drugs have greatly reduced illness and death from infectious diseases. Antibiotics use has been beneficial and, when prescribed and taken correctly, their value in patient care is enormous.[1] However, subsequent overuse and inappropriate use of antibiotics has led to the emergence of bacterial resistance, in addition to costly prescriptions and exposure to unnecessary side effects particularly among children, such as rash, diarrhea, and rarely allergic reactions.[2, 3] Studies have shown that physicians inappropriately prescribe antibiotics for infections caused by viruses. They also prescribe antibiotics that kill a wide variety of bacteria when an antibiotic that kills specific bacteria should be prescribed. Physicians may also prescribe the wrong dose for the wrong length of time.[4] The Centers for Disease Control and Prevention (CDC) estimates that more than 100 million antibiotic prescriptions are written each year in the ambulatory care setting and approximately one half of those prescriptions are unnecessary.[5,6] Inappropriate antibiotic prescribing is due to many factors including patients who insist on antibiotics, physicians who do not have enough time to explain why antibiotics are not necessary and therefore simply prescribe them to save time, physicians who do not know when to prescribe antibiotics or how to recognize a serious bacterial infection, or physicians who are overly cautious.[4] In the year 2000 in low-income countries, acute upper respiratory tract infections (AURTIs) and diarrhea accounted for 27% and 23%, respectively of childhood mortality and were leading causes of childhood morbidity.[7] Moreover, AURTIs and diarrhea represent about half of the deaths in under-five children in Egypt and are responsible for 39% and 20% of outpatient consultations at Primary Health Care (PHC) facilities, respectively. They are also a common cause for

hospital admissions.[8] When parental time off work is added to the costs of health care, they pose a major financial burden.[3]

Most of the common childhood infections are caused by viruses. It is estimated that 90% of AURTIs are self limiting viral illnesses and even bacterial infections often run a self limiting course.[9] There is evidence from randomized placebo-controlled trials (RCTs) that antibiotics have limited efficacy in treating a large proportion of acute upper respiratory tract infections in adults and children. These conditions are largely self-limiting and complications are likely to be rare if antibiotics are withheld.[10]

Over prescription and abuse of antibiotics in the treatment of AURTIs and diarrhea is a worldwide problem, potentially leading to widespread antibiotic resistance.[11] According to the World Health Organization (WHO) in the year 2010, more than 40% of children with acute diarrhea receive unnecessary antibiotics and up to 60% of children with AURTIs receive antibiotics inappropriately.[12] Bear in mind that in a child recently treated with antibiotics, the resistant bacteria can reside in the throat for up to 3 months thus posing a potential source of spread in nurseries and day care centers.[9]

In Egypt, the Ministry of Health and Population adopted the Integrated Management of Childhood Illness (IMCI) strategy in 1997 in the context of its efforts to integrate vertical program activities into Primary Health Care (PHC). In March 1998, the IMCI working group developed a detailed national plan of activities addressing all components of the IMCI strategy. Also, IMCI has been included in the basic package of services to be delivered at PHC facilities; an initiative supported by WHO, The United Nations Children's Emergency Funds (UNICEF), United States Agency for International Development (USAID), and the World Bank.[8] This IMCI is a cost-effective strategy that improves the quality of care through the use of evidence-based management protocols for the most common causes of childhood death and illness at PHC. Moreover, IMCI contributes to approaches to improve the basic functions of drug management-selection, procurement, distribution and use-leading to sustainable systems that make essential drugs available at all levels. Standard case management discourages inappropriate care such as the overuse of antibiotics and other drugs.[13]

The aim of the study was to assess the adherence of family physicians to guidelines for antibiotic prescription in acute upper respiratory tract infections and diarrhea in children under 5 years.

METHODS

A cross sectional study was conducted in four randomly selected family health facilities representing four randomly selected health districts among the eight districts in Alexandria governorate.

The sample size was calculated by the computer package Epi-info version 6[14] based on a prevalence of 74% for non-adherence to antibiotic prescribing guidelines[11], a degree of precision of 5, and an alpha level of 0.05. The sample amounted to 300 consultation sessions of AURTs and/ or diarrhea of children under 5 year. It was then proportionately allocated to the four studied family health facilities according to attendance rate in each studied facility.

Data collection started in August 2012 till February 2013. An observational checklist and questionnaire were designed to assess adherence of family physicians to antibiotic prescribing guidelines in AURTIs and diarrhea in children under 5 years based on IMCI guidelines.[13] It included 83 items covering data about the studied family health facilities and personal data of family physicians, data about the attending children, and other questions concerning the followings:

i) Family physicians' history taking practices: a scoring system was used giving a value of 1 for each item met and zero for the unmet one.

ii) Family physicians' physical examination practices: a scoring system was used giving a value of 2 for each item fully met, a value of 1 for partially met item and a value of zero for the unmet one.

iii) Family physicians' management practices: a scoring system was used giving a value of 2 for each item fully met, a value of 1 for the partially met item, and zero for the unmet one. The total score of each of the above three mentioned items was divided into three categories as follows: poor adherence (less than 50%), partial adherence (50% - < 70%), and good adherence (70% or more). In addition the percentage of total score from maximum score was calculated.

iv) The diagnosis of the child condition, if parents asked the physician to prescribe antibiotic, appropriateness of antibiotic prescription, type of antibiotic, and given treatment instructions.

A pilot study was carried out for pre-testing of the observational checklist and questionnaire and modifications were done. The pilot study was done over a purposive sample of 10 consultation sessions of AURTIs or/and diarrhea of children under 5 years. Those sessions enrolled in the pilot study were not included in the study sample.

Statistical Analysis

Data were reviewed, coded, verified and statistically analyzed using the computer package SPSS version 16. The Chi-square significance test (X^2) was used to test significance of qualitative variables. The Fisher's exact test and the Monte Carlo test were used when Chi-square significance test (X^2) was not applicable. Pearson correlation coefficient was used as statistical measure of the strength of a linear relationship between paired data. Results were considered significant at P value < 0.05.

Ethical Considerations

The study was approved by the institutional review board and the ethics committee of High Institute of Public Health, Alexandria University. The study conformed to the principles of Helsinki declaration (2013) and the international ethics guidelines. A written permission from the Ministry of Health and Population was obtained to carry out the study after being approved from its ethical committee. A verbal consent was taken from parents of children who accepted to participate in the study after explanation of the purpose and benefits of the study. Anonymity and confidentiality of the data was assured.

RESULTS

The included family physicians were predominately females (96.4%). The mean duration since their graduation was 19.9 years and the mean period of their experience was 17.8 years. The majority of family physicians (71.4%) had been trained on family medicine and 50% had IMCI training program, with the mean duration since last IMCI training 6.3 years (Table 1). Concerning the age and sex of the children attending the studied family health facilities and included in the current study, 51% of the children were females. The maximum age noticed was 59 months and the minimum was 2 months with a mean age of 21.8 months (Table 2). Antibiotics were prescribed in 49.7% of the observed sessions and were prescribed appropriately in 55.4% of the sessions. Amoxycillin was the most frequently prescribed antibiotic in 52.4% of children receiving antibiotics and the least was benzathine penicillin (0.7 %). The results showed that the type of prescribed antibiotic was appropriate in 91.8% of the sessions. Parents did not request antibiotic prescription from physicians in 92% of consultation sessions (Table 3). The mean percentage score of family physicians` history taking practices according to IMCI guidelines was 39.9± 9.0, that of physical examination practices was 59.3±10.9 and the mean percentage score of family physicians` management practices was 53.9 ±18.5 (Table 4).

Table (1): Socio-demographic characteristics of the studied family physicians

Socio-demographic and occupational characteristics	Studied physicians (n=28)	
	No.	%
Gender		
Male	1	3.6
Female	27	96.4
Duration of experience (years)		
Min-Max	0.5-33.0	
Mean±SD	17.8±10.1	
Duration of practice in the field of family medicine (years)		
Min-Max	0.5-14.0	
Mean±SD	6.2±3.9	
Training in family medicine		
No	8	28.6
Yes	20	71.4
IMCI training program		
No	14	50.0
Yes	14	50.0
Duration since last IMCI training (years) [n=14]		
Min-Max	1.0-14.0	
Mean±SD	6.3±3.3	

Table (2): Age and sex of the children attending the studied family health facilities

Child characteristics	Studied children (n=300)	
	No.	%
Sex		
Male	147	49.0
Female	153	51.0
Age (months)		
Min-Max	2-59	
Mean±SD	21.8±17.4	

The level of family physicians in history taking practices according to IMCI guidelines was found poor in 85.3%, fair in 14% and good in 0.7% of the studied consultation sessions. Regarding the level of family physicians practices in physical examination, it was found fair in 66%, good in 19.3% and poor in 14.7% of studied consultation sessions. Likewise, the level of family physicians in management practices was fair in 48.3%, poor in 35% and good in 16.7% of studied sessions. The level of history taking practices was generally poor in most of AURTIs sessions (90.8%), (MCP=0.001). The level was fair in 34.7% of combined AURTIs and diarrhea sessions and was good in 3.8% of AURTIs and diarrhea sessions as well as in 0.5% of AURTIs sessions. The level of physical examination practices was mostly fair in 80% of diarrheal sessions. The level was good in 23.1% of combined AURTIs and diarrhea sessions, in 20.5% of AURTIs sessions, and in 12.7% of diarrhea sessions. However, the level was poor in 16.9% of AURTIs sessions. Likewise, the level of management practices was more frequently fair in 61.5% of AURTIs and diarrheal sessions. The level was poor in 37% of AURTIs sessions whereas it was good in 23.1% of AURTIs and diarrhea sessions, in 20% of diarrhea sessions and in 15.1% of AURTIs sessions (Table 5).

Table (3): Prescribed antibiotics by family physicians to treat the studied children with AURTIs and diarrhea

Prescribed antibiotics	Studied physicians` consultation sessions (n=300)	
	No.	%
Prescription of antibiotic in treatment		
Prescribed	147	49
Not prescribed	149	49.7
Not applicable (referred)	4	1.3
Appropriateness of antibiotic prescription		
Appropriate	166	55.4
Inappropriate	149	43.3
Not applicable (referred)	4	1.3
Appropriateness of type of prescribed antibiotic [n=147]		
Yes	135	91.8
No	12	8.2
Type of antibiotic prescribed [n=147]		
Amoxycillin	77	52.4
Cotrimoxazole	11	7.5
Amoxycillin-clavulante	12	8.2
Azithromycin	7	4.8
Benzathine penicillin	1	0.7
Cefotaxime	5	3.4
Cefadroxil	19	12.9
Metronidazole	5	3.4
Tetracycline eye ointment	1	0.7
Nifuroxazide	11	7.5
Parents asked physician to prescribe antibiotic		
No	276	92.0
Yes	24	8.0

Table (4): Scores of family physicians' practices in consultation sessions of AURTIs and diarrhea

Percentage of practice score	Studied physicians' consultation sessions (n=300)
History taking	
Min-Max	12.5-73.7
Mean±SD	39.9±9.0
Physical examination	
Min-Max	16.7-95.2
Mean±SD	59.3±10.9
Management	
Min-Max	0.0-100.0
Mean±SD	53.9±18.5

A direct statistically significant correlation existed between the percentage score of family physicians' history taking practices and the age of the studied children (p= 0.016 and r= 0.139). However, an indirect statistically significant correlation existed between physical examination practices score and the age of the studied children (p<0.0001 and r= -0.215). An indirect correlation was detected between management practice score and the age of the studied children although the relationship was not statistical significant (p>0.05) (Table 6). The history taking practices score was poor in the majority of non-trained family physicians in IMCI or family medicine (91.2% and 92.9% respectively), those relations were statistically insignificant. Meanwhile, physical examination practice score was significantly fair in 70% of trained physicians on IMCI and in 81% of non trained physicians on family medicine (P<0.0001 and P=0.011 respectively). Similarly, management practice score was significantly fair in 55.1% of IMCI trained family physicians and in 53.1% of family medicine trained physicians (P<0.0001) (Table 7). Family physicians` practice scores showed a direct statistically insignificant correlation with the time passed since their IMCI training was taken. This also applied for the adherence practice scores of family physicians (Table 8).

Table (5): Distribution of family physicians according to their practices levels in consultation sessions according to diagnosis of cases

Practice levels	Diagnosis (n=300)								Sig.
	AURTI (n=219)		Diarrhea (n=55)		AURTI and Diarrhea (n=26)		Total (n=300)		
	No.	%	No.	%	No.	%	No.	%	
History taking level									
Poor	199	90.8	41	74.5	16	61.5	256	85.3	MCP=0.001*
Fair	19	8.7	14	25.5	9	34.7	42	14.0	
Good	1	0.5	0	0.0	1	3.8	2	0.7	
Physical examination level									
Poor	37	16.9	4	7.3	3	11.5	44	14.7	MCP=0.162
Fair	137	62.6	44	80.0	17	65.4	198	66.0	
Good	45	20.5	7	12.7	6	23.1	58	19.3	
Management level									
Poor	81	37.0	20	36.4	4	15.4	105	35.0	MCP=0.227
Fair	105	47.9	24	43.6	16	61.5	145	48.3	
Good	33	15.1	11	20.0	6	23.1	50	16.7	

MCP: Monte Carlo test   *significant at P≤0.05

Table (6): Correlation between family physicians` practice scores and age of the studied children

Practice scores	Age of the children	
	r	P
History taking	0.139	0.016*
Physical examination	-0.215	<0.0001*
Management	-0.049	0.4

r: Pearson correlation coefficient   *significant at P≤0.05

Table (7): Correlation between family physicians` practice levels and their training

Practice levels	Studied family physicians` consultation sessions									
	IMCI training				Sig.	Family medicine training				Sig.
	No (n=113)		Yes (n=187)			No (n=42)		Yes (n=258)		
	No.	%	No.	%		No	%	No.	%	
History taking										
Poor	103	91.2	153	81.8		39	92.9	217	84.1	
Fair	10	8.8	32	17.1	MCP=0.06	3	7.1	39	15.1	MCP=0.389
Good	0	0.0	2	1.1		0	0.0	2	0.8	
Physical examination										
Poor	31	27.4	13	7.0		7	16.7	37	14.3	
Fair	67	59.3	131	70.0	X^2=24.825 $P<0.0001$*	34	81.0	164	63.6	X^2=9.047 $P=0.011$*
Good	15	13.3	43	23.0		1	2.3	57	22.1	
Management										
Poor	67	59.3	38	20.3		33	78.7	72	27.9	
Fair	42	37.2	103	55.1	X^2=53.983 $P<0.0001$*	8	19.0	137	53.1	X^2=41.136 $P<0.0001$*
Good	4	3.5	46	24.6		1	2.3	49	19.0	

MCP: Monte Carlo test X^2: Chi-Square test   *significant at $P≤0.05$

Table (8): Correlation between family physicians` practice score and the time since IMCI training

Practices score	Time passed since IMCI training	
	r	P
History taking	0.09	0.211
Physical examination	0.011	0.88
Management	0.03	0.686

r: Pearson correlation coefficient

DISCUSSION

The majority of the family physician (71.4%) included in the study had been found to be trained on family medicine and IMCI in comparison with studies done by Moustafa NS[15] and Assi B[16] who both found nearly the same results.

In the present study, antibiotics were prescribed in (49%) of all children. In (43.3%) of the consultation sessions, antibiotics were inappropriately prescribed according to IMCI guidelines. This agreed with a study done in Kuwait[2] investigating the extent to which antibiotic use follows the international guidelines in treating upper respiratory tract infections in primary health care centers. The study revealed that 50% of patients were given antibiotics. Another study done in the USA[17] that evaluated antibiotic prescription for children with upper respiratory tract infections in primary health care showed that about 47% of patients were given antibiotics.

In the aforementioned study done in Kuwait[2], the prevalence of non evidence based antibiotic prescriptions was as high as 47% and only about 3% of the antibiotic prescriptions could be justified according to evidence-based guidelines. The study also showed that evidence-based guidelines applied also to 48.9% of patients that were not given antibiotics. A multi-country study[18] from Europe showed that about 85% of antibiotic prescriptions were not evidence-based. In fact, over-prescription and inappropriate use of antibiotics have been documented in primary care settings globally. For instance, 50% of all antibiotics prescribed in primary health care are of questionable value. Butler et al.[19] argued that despite the fact that antibiotic treatment does not bring meaningful benefits for most patients, there are considerable barriers in implementing evidence-based guidelines. Furthermore, a study from Norway[20] addressing antibiotic prescription patterns for respiratory tract infections, found large variations among general practitioners' antibiotic prescription habits; being a specialist gave lower prescription rate, also doctors whose experience 12–22 years of practice had the lowest prescription rates. Ever since antibiotics were discovered and consequent health benefits associated with them were realized, both physicians and lay people have tended to believe that antibiotics can treat any infection. There is also a belief that patients pressure physicians to prescribe antibiotics.[21] Despite popular belief, the present study showed that only about (8%) of the parents requested antibiotics from the family physicians. This confirms the study done in Kuwait, which showed that only about 3% of the patients requested

an antibiotic[2] but comes contrary to a study conducted in United Kingdom[21] investigating the nfluence of patients' expectations on antibiotic management of acute lower respiratory tract illness in general practice which showed that 72% of the patients requested antibiotics.

In the current study, the type of prescribed antibiotic was appropriate in most of the sessions (91.8%). This agreed with a study done by El Mahalli and Akl`s in Alexandria, Egypt[22] that evaluated effect of adopting integrated management of childhood illness guidelines on drug use at primary health care centers and revealed that drug choice was correct in 89.3%.

The present work showed that family physicians` adherence practices to guidelines on history taking were poor in 85.3%. Similar results were reported in study done by Khalil[23] in Alexandria that included observation of physicians` performance while assessing family file utilization in family physicians practices. That study revealed that family physicians` history taking practices were poor. However, this came contradictory a study from Yemen[24] that assessed the quality of management for acute respiratory tract infections and diarrheal diseases and showed that more than half of the physicians (55.3%) were fair in history taking practices.

Based on the researcher`s own observation, poor family physicians` adherence to guidelines on history taking may be due to work overload and non use of IMCI sheet while taking history of the child condition or filling the sheet at the end of the consultation sessions. In the current study, the family physicians` adherence practices were fair in physical examination (66%). These results agree with a study in Yemen[24] which found that 52.8% of the physicians were fair in physical examination on the contrary to study done by Khalil in Alexandria[23] which revealed that family physicians were poor in physical examination.

The present study revealed that family physicians` adherence was fair on management (48.3%). This came contradictory to a study done by Khalil in Alexandria[23] which revealed that physicians were poor in management practices. Nevertheless, this finding agreed with the study done by Sabra in Alexandria[25] evaluating physicians' performance in dealing with ARI in children which revealed that management practices leveled poor. Poor level of care was attributed to workload, deficiency in equipment, drugs, non availability of family files and proper records.[23] There was a small percentage of good adherence practices in the present study as the researcher noticed that the majority of family physicians did not count respiratory rate or check for chest indrawing also examination of eardrum by otoscope was not done at all. Otoscopes were present in only one of the studied health facilities but those otoscopes were not in use as the physicians were not trained on using them. This agree with a study from Botswana[11] which revealed that adherence to guidelines on physical examination of cases with acute respiratory infection was poor due to failure to check the

respiratory rate and examination for chest indrawing. Careful training of primary health care providers in the assessment of respiratory rate and chest indrawing is essential if these clinical findings are to be used as reliable indicators in the management of cases with acute respiratory infection.[11] This coincides with a study done in two Egyptian governorates; El Minya and El Qaliubia[26] to evaluate impact of training on assessment of diarrhea and acute respiratory infection which reported poor adherence with the examination guidelines. Some physicians say it is not necessary to follow guidelines precisely. For example, some believe that an experienced physician can assess rapid breathing without counting breaths per minute for each child. Training primarily increases knowledge, but some argue that greater knowledge is not necessarily reflected in improved practice. In addition external barriers, such as administrative or economic problems, can impede compliance. Moreover, guidelines may be ignored simply because there are neither rewards for adherence nor penalties for failure to comply. Another factor may contribute to poor diagnosis and treatment that the physicians in this study spent very little time with each child. An examination that complies with the IMCI guidelines requires at least 10-15 minutes for an experienced physician. No careful examination could be completed in lesser time.[26] The same was observed by the researcher in the present work.

The current study, revealed that family physicians` adherence practices according to diagnosis of children on history taking was generally poor although it was better in the combined AURTIs and diarrhea sessions than AURTIs or diarrhea sessions alone. On the otherhand, family physicians` physical examination adherence was fair most frequently in diarrheal sessions, although this was found statistically insignificant. This disagrees with a study done in Botswana[11] which showed that adherence to guidelines on history taking was fair but poor on examination in both acute respiratory infection and diarrhea cases.

The IMCI strategy has been shown to improve care for ill children in outpatient settings in developing countries[27]. In the current study, family physicians` history taking adherence leveled insignificantly higher in the IMCI and family medicine trained physicians. Meanwhile, physical examination adherence leveled was significantly higher in IMCI trained physicians, and in physicians not trained in family medicine. However, management adherence scored significantly higher in IMCI and family medicine trained physicians.

These results were supported by similar findings in a study from Yemen[24] which showed that trained physicians performed better than those untrained. Similar results were reported in a multi-country study from Brazil, Uganda and the United Republic of Tanzania[28] that evaluated the IMCI among health workers in first level facilities and showed that IMCI improves health workers' performance significantly. Another study from Afghanistan[29] assessing trends in the quality of health care

for children revealed that physicians` knowledge, job satisfaction, refresher training and IMCI training were associated with better performance in assessment and counseling.

The present study showed that family physicians` adherence practices increased significantly with increased time passed since their IMCI training was taken. A study from South Africa[30] that evaluated the Quality of IMCI among IMCI trained health workers revealed that no association was found between health worker performance and the time since being trained in IMCI. To the researcher`s opinion this is due to shortening IMCI training from the old standard in-service 11 days IMCI training course to recent short in-service 5 days course in Egypt. This was supported by a systematic review showing that shortening IMCI training reduced its effectiveness. A review across all comparisons suggested that the standard in-service IMCI training course is somewhat more effective than short training although the magnitude of the difference was unclear.[31, 32]

In the present work, family physicians` history taking adherence scored better with older children. Family physicians showed good physical examination and management adherence practices score with younger children and adherence practices was not affected by gender of the child. This came contradictory to results of a study from India[33] that evaluated the adherence to guidelines in management of diarrhea in children and showed that adherence to guidelines was not affected by age and gender of the child. The results of the current study go in line with a study done in Afghanistan[29] which revealed that assessment and counseling quality did not differ significantly in relation to the sex of the child, although adherence to assessment standards was higher when providers were attending children less than 2 years of age. Similarly, a study from Morocco[34] that assessed the impact of the IMCI strategy on health care quality found that adherence to IMCI tasks was significantly higher for younger children.

CONCLUSION AND RECOMMENDATIONS

Family physicians' antibiotics prescription is inappropriate in a significant number of the studied children. Meanwhile, the type of the prescribed antibiotic is generally appropriate.

From the results of this study we can recommend that continuous medical education programs should be carried out for family physicians about appropriate use of antibiotics, consequences of antibiotic overuse and pathogenesis of infections especially AURTIs and diarrhea which do not require antibiotics. Also medical education should be given for all physicians and pharmacists about the appropriate use of antibiotics and to emphasize their role in raising awareness of the community.

Conflict of Interest: None to declare

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