

The difficulties experienced during the preparation and administration of oral drugs by parents at home: a cross-sectional study from Palestine

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Abstract

Background: Failure to properly administer drugs to children at home may cause adverse events and may be fatal, which makes it a challenging job for parents or caregivers. The main goal of this study was to investigate the problems and difficulties that parents or caregivers faced when administering oral drugs to their children at home.

Methods: A cross-sectional study was conducted using a questionnaire consisting of 'yes/no' and multiple-response questions to assess parents' experiences and problems with administering medication to their children at home. Data was collected from parents who visited primary health care centres in Nablus. Descriptive analysis was conducted to describe the characteristics of the sample.

Results: We interviewed 420 participants. 91.9% of the participants used drugs without prescription from a doctor, and the most commonly used non-prescription medicines were antipyretics (n=386, 100%), influenza drugs (n=142, 36.8%), cough drugs (n=109, 28.2%) and antibiotics (n= 102, 26.4%). The study showed that 83.6% of parents use a syringe, 21.7% use a teaspoon, 9.3% use the cup attached with the drug and 7.1% use a tablespoon in administering oral liquid medications to their children. 36.8% of the parents who mentioned that their children did not like taking tablets persuaded their children to drink more water, 31.1% requested another form of drug and 30.2% crushed a capsule. When the children did not like taking liquid medications, almost two-thirds of the participants (65.7%) insisted their children take them, 25.5% persuaded them to drink it with more water and 21.5% mixed it with juice.

Conclusions: This study has shown that there is a proportion of caregivers or parents who administer oral drugs to their children wrongly, which may involve giving them at the wrong intervals or doses, using incorrect instruments, using non-prescription drugs or mixing them with food, juice or milk. The development of educational programs that will provide parents with education about medication administration is therefore recommended.

Background

The administration of drugs at home may result in fatal errors for the children, made by parents or caregivers, and may occur during administration, or by giving the drugs in the incorrect intervals or doses. The proper administration of drugs requires the calculation of correct doses based on the weight of the child, using the right instruments, slow administration, and respect for the powder weight of drugs. Failure to implement these conditions could cause adverse events. Non-prescription or over-the-counter (OTC) drugs have also become excessively widespread in recent years, and have become major issues in children's health [1–4]. Low educational levels and the health culture, make incorrect administration and drug errors more common in developing countries, because outpatient clinics are very crowded and parents or caregivers are not well educated about health [5].

A prospective study conducted in the United States observed 242 medication administrations in 92 patients' homes, among which 72 administration errors were found, four of which led to significant injury.

Two life threatening errors were noted [6]. A study of 97 caregivers recruited from childcare centres in Australia revealed that many measured incorrect doses and used inappropriate dosage intervals [7]. A cross-sectional study conducted in Turkey on 205 parents found that 42.4% always used non-prescribed drugs to reduce their children's fever and only 53.7% sought medical advice [8]. A study about swallowing difficulties when taking oral solid medicines was undertaken with 1051 participants in Germany, and revealed that 37.4% of the participants had such difficulties, and that 58.8% of those who had difficulties altered their medications in a way made them less safe and less effective [9]. A retrospective study involving cases of severe injury or death from medication errors included 238 cases, and reported that 162 occurred at home, and that excessive dosing was the most common error, at 72% [10].

To our knowledge, several studies have been conducted among parents [11–15], considering aspects other than the difficulties that the parents experienced in administering oral medications to their children. Parental difficulties in administering oral medications to their children were not assessed by any of these studies, however, or any other study conducted in Palestine. This study is thus the first conducted in Palestine to evaluate that issue. Medication efficacy may be altered by the use of inappropriate techniques used by the parents to overcome their children's' difficulties in swallowing oral medications. Acetaminophen is well established for safe use in children, and the risk of toxic reactions in children is less than in adults, and when it does happen it is mostly due to intentional overdoses [16, 17]. On the other hand, the under-dosing of acetaminophen in pediatric patients with fever may prolong their condition [15]. Oral liquid medications are commonly given by teaspoon, the capacity of which can range from 1.5 ml to 9 ml, leading to dosing errors with the subsequent complications. Little information about using self-therapy antibiotics in children in developing countries is available, despite the high rate of antibiotic resistance.

This study was undertaken mainly to investigate the difficulties experienced by a sample of the Palestinian population in administering oral medications to their children at home. It is hoped that this research will contribute to a deeper understanding of this problem for many reasons. The overuse of self-therapy antibiotics is an important cause in the global emergence of antibiotic resistance. Some medication administration errors are life-threatening, as noted above. The use of the incorrect tools to administer medication leads to incorrect doses which have bad consequences on children's health. This study will provide a good foundation for further studies in this field. Healthcare providers are encouraged to educate patients about the correct techniques to overcome medication swallowing difficulties. Baseline data will be available from this study for educational purposes.

Methods

Study design and setting

This study was designed as a cross-sectional study. The study was conducted in the primary care centres in Nablus. Nablus city was chosen as it is one of the largest cities in Palestine and because it is the

investigator's place of residence. The data was collected over a period of 3 months from June 2018 to 31 to August 2018.

Sample size

An online Raosoft sample size calculator (<http://www.raosoft.com/samplesize.html>) was applied to determine the sample size, which was 377. A confidence level of 95% was assumed, a 5% margin of error, and a response distribution of 50%, adding a non-response rate of 10% to increase accuracy.

Inclusion and exclusion criteria

Inclusion criteria for this study were: parents aged between 19 years and 48 years, who had a child or more aged between 6 months and 10 years [18–21], and who signed written consent to participate in the study. Subjects with vision problems, cognitive/physical disabilities, and caregivers other than mothers and fathers were excluded. Convenience sampling was used.

Data collection

The data was collected using a data collection questionnaire based on the relevant literature [5, 22–24]. A pilot study was undertaken with 30 participants to check for necessary modifications in the questionnaire, but as the selected participants all understood the questionnaire, no modifications were made. The data collection form included four sections. The questionnaire was reviewed and evaluated by experts in the field of pharmacy practice to ensure its content validity.

The first section gathered demographic information including sex, residency, age, occupational status, marital status, educational level, monthly income and number of children between six months and ten years. The second section gathered information about drugs, including questions about who is responsible for administering medication at home, whether their child had ever refused to take tablets/pills, what was done when their child did not like taking tablet drugs, whether the treatment process failed because their child did not like taking tablet drugs, whether their child ever refused to take liquid medications, what was done when their child did not like taking liquid drugs, whether the treatment process failed because their child did not like taking liquid medications and the source of information for drugs given to their child.

The third section gathered information about the child, including questions about whether the child had difficulties in swallowing medication, the type of swallowing problem, how many times they complained about swallowing difficulties, whether swallowing difficulties were discussed with a doctor, and the doctor's recommendations.

The fourth section gathered information about practices, including questions about the tool had you used for giving a child their prescribed liquid medications, whether the leaflet attached to the drug was read, whether the child was given a dose higher than that prescribed to treat them more quickly, whether the child was given more than one type of oral medication at the same time, whether the child was given medications without prescription from a doctor, the type of medications used, whether the time the drugs

were given to the child were recorded, and what was done with any remaining drugs when the child had recovered. They were also asked for the hours at which they would give their child medicine if it had been prescribed for three times a day.

Ethical issues

Ethical approval for the study was obtained from institutional review board (IRB) at An-Najah National University. The questionnaire content was described before the interview, and participants assigned a written consent form. The participant names and information were confidential.

Statistical analysis

The data was coded, categorised, and entered into the Statistical Package for the Social Sciences (SPSS), version 16.0. Descriptive statistics (e.g. frequency, percentage, mean, standard deviation) were used to illustrate the sociodemographic data and clinical data.

Results

Sample characteristics

A total of 420 participants completed the survey giving a valid response rate of 96.8%. Table 1 provides the demographic information of the participants of our study. The mean age of participants was 30.2 with a standard deviation of 5.96; and the average number of children between 6 months and 10 years for each participant was 2.04 with a standard deviation of 0.98. Mothers constituted the majority of the participants (98.8%), most participants (86.4%) lived in the city, and (59.8%) had university education or higher. The majority of the participants had an income between 2000 and 4999 Shekels.

Table 1
Demographic information of participants (N = 420)

Characteristics	Item	Number (%)
Gender	Male	5 (1.2)
	Female	415 (98.8)
Age	< 25	74 (17.6)
	25–29	135 (32)
	30–34	107 (25.5)
	35–39	73 (17.4)
	40–44	24 (5.7)
	45–48	7 (1.7)
	Residency	City
Village		48 (11.4)
Palestinian refugee camp		9 (2.1)
Number of children aged between six months and ten years	1 child	147 (35)
	2 children	147 (35)
	3 children	93(22.1)
	4 children	27(6.4)
	5 children	6(1.4)
Participant's educational level	Not educated	4(1)
	Primary school	24(5.7)
	Secondary school	141(33.60)
	University	251(59.8)
Father employment ^a	Employed	406(96.7)
	Non employed	10(2.4)
Mother employment	Employed	83(19.8)
^a there are 4 dead fathers		
^b 1Israeli Shekel(ILS) equals 0.27 US Dollar		

Characteristics	Item	Number (%)
	Non employed	337(80.2)
Income level of the family ^b	< 2000 ILS	102(24.3)
	2000–4999 ILS	247(58.8)
	5000–9999 ILS	56(13.3)
	> 10000 ILS	15(3.6)
Health insurance	Governmental	219(52.1)
	Private	58(13.8)
	No insurance	143(34)
^a there are 4 dead fathers		
^b 1Israeli Shekel(ILS) equals 0.27 US Dollar		

Oral drug administration at home and acceptance behaviors of children

93.3% of those responsible for drug administration at home were mothers (Table 2). When asked about the acceptance behaviour of their children during oral medication administration, over half of those surveyed reported that they didn't try to give their children tablets, 25.2% of those who had tried to do so reported that their children did not like taking tablet drugs (Table 2). When the children did not like taking tablet drugs, 36.8% of the parents persuaded their children to drink more water, 31.1% requested another form of the drug and 30.2% crushed the capsule (Table 2).

Table 2

Oral drug administration at home and acceptance behaviors of children (N = 420)

Variable	Frequency (%)
The person responsible for drug administration at home?	
Father	6(1.4)
Mother	392(93.3)
Father & mother	21(5)
Brother	1(0.2)
Did the child mind take oral pills?	
Yes	106(25.2)
No	59(14)
Did not try it	255(60.7)
What did they do when the child refused to take tablet drugs? ^a	
Drink more water	39(36.8)
Crush capsule	32(30.2)
Open capsule	9(8.5)
Break capsule	11(10.4)
Change head position	6(5.7)
Mix with food	8(7.5)
Mix with milk	3(2.8)
Dissolute in water or other drinks	32(30.2)
Request another form	33(31.1)
Stop drug	15(14.2)
Give during sleep	3(2.8)
What did they do when the child refused to take liquid drugs? ^a	
Force child	153(65.7)
Drink more water	57(25.5)
Mix with milk	11(4.7)
^a Total exceeds 100% as data are overlapping due to multiple answers	

Variable	Frequency (%)
Mix with juice	50(21.4)
Mix with food	12(5.1)
Stop drug	26(11.2)
Give during sleep	13(5.6)
Source of information about drugs ^a	
Medical leaflet	216(51.4)
Doctor	280(66.7)
Nurse	5(1.2)
Pharmacist	108(25.7)
Ordinary people	11(2.6)
Old experience	49(11.7)
Internet	50(11.9)
^a Total exceeds 100% as data are overlapping due to multiple answers	

All participants reported that they tried liquid medications, 55.5% reported that their children refused to take liquid medications, and when the child did not like taking liquid medications, almost two-thirds of the participants (65.7%) insisted their children take it anyway, 25.5% persuaded them to drink it with more water and 21.5% mixed it with juice (Table 2). There was a delay in treatment in 48.1% when the children did not like taking capsules or tablets, whereas it was 40.8% among those did not like taking liquid drugs.

As shown in Table 2, most parents (66.7%) obtained information about the medication from their doctors, 51.4% from medical leaflets and 25.7% from pharmacists.

Swallowing problems during the administration of oral medications

Around 33.1% of those who were interviewed reported that their children had swallowing problems during the administration of oral medication, where vomiting was the most common (59%) followed by drugs catching in the throat, a sense of discomfort and coughing (23% each). Of those who reported swallowing problems, 54% discussed the problem with their doctor, who advised them to change the drug in most cases (48%) or offered advice to overcome the problem (38.7%); (Table 3).

Table 3
Swallowing problems influencing oral drug administration for managing
childhood as reported by parents (N = 139)

Variable	Frequency (%)
Type of problem a	
Drugs hang in the throat	32(23)
Uncomfortable sense	32(23)
Chocking sense	18(12.9)
Cough	32(23)
Vomiting	82(59)
How many times did he complain of swallowing difficulty?	
Always	29(20.9)
Sometimes	109(78.4)
One time	1(0.7)
Doctor advise about the problem	
Change drug	36(48)
Change dose	1(1.3)
Give some tips to overcome the problem	29(38.7)
Forget the problem	9(12)
^a Total exceeds 100% as data are overlapping due to multiple answers	

Parents' practices during the administration of oral drugs

83.6% of the participants used a syringe to administer oral liquid drugs, 21.7% used a teaspoon, 9.3% used the cup attached to the drug and 7.1% used a tablespoon (Table 4). A minority of participants (12.4%) reported that they gave drugs in doses higher than prescribed by the doctor to treat their children more quickly. 45% of participants reported that they gave two drugs by mouth at the same time. Almost two-thirds of the participants (69%) said that they disposed of the residual amount of the drug when the child was recovered, while 30% kept it for later use.

Table 4

Parents' practices during the administration of oral drugs (N = 420)

Variable	Frequency (%)
A tool to give liquid drugs ^a	
Cup attached with drug	39(9.3)
Teaspoon	91(21.7)
Tablespoon	30(7.1)
Syringe	351(83.6)
Other tools	4(1)
Reading leaflet	
Yes	382(91)
No	38(9)
Recording time when giving the drug	
Yes	228(54.3)
No	192(45.7)
^a Total exceeds 100% as data are overlapping due to multiple answers	

Surprisingly, 91.9% of the participants used drugs without prescription from a doctor. The most commonly used self-therapies were antipyretics (n: 386, 100%), influenza drugs (n = 142, 36.8%), cough drugs (n = 109, 28.2%) and antibiotics (n: 102, 26.4%); (Table 5). In the final part of the survey, the participants were asked about the interval that should be left between each dose when a drug prescribed to be given three times daily, and it was revealed that 80.5% administered medication incorrectly.

Table 5

Types of self-therapies used by parents for their children ^a (N = 386)

Variable	Frequency (%)
Antipyretics	386(100)
Antibiotics	102(26.4)
Antidiarrheal	37(9.6)
Laxatives	10(2.6)
Antiemetic	17(4.4)
Cough drugs	109(28.2)
Colic drugs	59(15.3)
Creams	56(15.5)
Influenza drugs	142(36.8)
^a Total exceeds 100% as data are overlapping due to multiple answers	

Discussion

This study analyses the difficulties and errors made by parents when administering oral medication to their children at home. Erroneous practices have been discovered through our study, such as the use of inappropriate tools to give medicine to children, the use of over-the-counter medications, the administration of medications at incorrect intervals, and incorrect practices when the child did not like taking oral drugs, such as mixing the drugs with food or opening tablets.

The study results showed that children liked taking tablets less than liquid drugs. 55.5% of the children refused to take liquid medicine, and only 25.2% refused to take tablets. Boztepe et al [5] reported that 24.5% of their participants had children who did not like taking oral liquid drugs, whereas only 19.4% did not like taking tablets. Accordingly, tablets were refused less frequently than oral drugs. All participants of the study had tried liquid medication for their children aged between six months and ten years, but only 39.2% had tried tablets for the same age group.

A child's adaptation to their drugs may be adversely affected by many factors, including the unpleasant taste [25], and this maladaptation could create difficulties for the parents when giving medications to their children. Parents try to overcome the problem using many alternatives, such as mixing the drug with milk or with their children's favourite food or juice. In our study, 7.5% of the participants tried mixing tablets with food, and 5.2% tried mixing the liquid drug with food. Drug efficacy and food absorption may be reduced when mixing drugs with certain foods [26, 27]. 21.5% of the participants in our study tried mixing liquid medicines with juice, which may have adverse effects on the absorption, bioavailability and

serum concentrations of some medicines. Kane and Lipsky [28] conducted a study about grapefruit-drug interaction, and reported that the serum concentrations of some drugs, such as cyclosporine, tacrolimus, and carbamazepine, were elevated if they interacted with grapefruit juice; these drugs have severe side effects depending on the dose, so the alteration of serum concentrations due to interaction with grapefruit juice may have side effects.

A collection of 60 drugs or more was established to have side effects if taken at the same time as, or even many hours after, taking a small amount of grapefruit juice [29]. 30.2% of the participating parents with children who did not like taking tablets crushed the capsules in order to administer them to their children. Treatment effectiveness can be altered when crushing tablets, which may alter the absorption of the drug, therefore increasing or decreasing its serum level, which may lead to serious side effects [30].

Dosing errors in children are common, because dosing for children needs to be assessed individually based on many factors, such as the patient's age and weight [31]. In this study, it was established that 21.7% of the participating parents used a teaspoon to give liquid medicine and 7.1% used a tablespoon, which may result in incorrect doses. Falagas et al [32] recommended that tablespoons and teaspoons should not be used due to their inaccuracy in dosing. In addition, 12.4% of the participating parents gave medicines with doses greater than that prescribed by the doctor in order to treat their children more quickly, which may in most cases lead to minor side effects, but also to hospitalisation or fatal side effects. Strenuous efforts are essential to prevent drug overdoses, which have recently become a leading cause of hospitalisation [33].

91.9% of the participating parents in our study reported using drugs without a prescription from a doctor for their children, with antipyretics being the most common. 36.8% of those using OTC medicines had given influenza drugs to their children and 28.2% cough drugs. Gunn et al [34] studied the toxicity of over-the-counter cough and cold drugs over a thirteen month duration; they showed that one in three cases presenting adverse events ended with death due to the use of over-the-counter cough and cold drugs, which means that these drugs are significantly associated with morbidity and mortality; If used acutely in overdoses or even chronically in correct doses. The use of non-prescribed antibiotics (26.4%) is also a serious issue because it may mask underlying infectious processes, and contribute to the global emergence of antibiotic resistance. Antibiotics use has recently become a problem, especially in developing countries [35].

Surprisingly, when the participating parents were asked how to give a drug three times a day, only 19.5% know that it should be given every 8 hours, which means that the other 80.5% give the medications at incorrect intervals. Drug administration at incorrect intervals is a form of medication administration error. To ensure that serum drug levels are therapeutic, parents should administer drugs at the correct time [36].

This study has several limitations. The ability to generalise the study's results to all Palestinians is limited because it was conducted only in Nablus. Different areas of Palestine should therefore be included in future studies for more representative results. Secondly, certain phenomena, such as the effect of the researcher being present when answering questions, may result in biases which cannot be controlled.

This is also a cross sectional study and causal relationships between variables could not be established. Lastly, the use of convenience sampling may have led to bias in the conclusions.

Conclusions

This study has shown that there are a proportion of caregivers or parents who administer oral drugs to their children wrongly, whether giving them at wrong intervals or doses, using incorrect instruments, or by administering non-prescription drugs. When children refuse to take their tablet or liquid medications, parents try to overcome the problem in many ways, such as mixing the drug with milk or with their children's favourite food or juice, or by crushing tablets. This study also established that parents give medicines in doses that are higher than those prescribed by the doctor in order to treat their children more quickly. Increased awareness about medication errors is needed by parents. The development of educational programs that will provide parents with education about the practice of medication administration is thus recommended. Also, it is recommended that when a doctor prescribe a drug to be given many times daily, he should write the intervals between doses in hours like (x drug should be given every 8 hours not to write give it 3 times a day). The source of information about drugs should be the doctor and the pharmacist not the nurse, ordinary people, old experience or the internet. The last recommendation is that a law should be devised to force pharmacies not to dispense antibiotics unless prescribed by a doctor.

List Of Abbreviations

IRB, Institutional Review Board; OTC, over-the-counter; SPSS, Statistical Package for the Social Sciences

Declarations

Ethics approval and consent to participate

The IRB at An-Najah National University approved this study. Verbal informed consent was taken from each parent before the interviews were started. The study protocol was approved (including the verbal consent process) by the IRB and did not require written consent. Parents were informed that their information would be coded and anonymised.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used for the current study are available from the corresponding author upon request.

Competing interests

The authors declare no conflict of interest. SZ is an Editorial Board member for the journal.

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Author contributions

RA, and AS collected data, performed the analyses, conducted the literature search, and drafted the manuscript. HF coordinated, supervised, critically reviewed the manuscript; and interpreted the results. SZ conceptualised and designed the study; coordinated, supervised and analysed the data; critically reviewed the manuscript; interpreted the results and assisted in writing the final manuscript. All authors read and approved the final manuscript.

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