

Knowledge and practice of mothers regarding administration of pediatric liquid dosage forms in Al-Tarmiyah district

By

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Abstract

Background: Parents of a sick child should have adequate knowledge about the illness, and optimum knowledge of the medicine prescribed by physicians and their dosage. **Aim:** To assess the knowledge and practice of mothers regarding pediatric liquid medicine administration in Al Tarmiyah district. **Methods:** A cross-sectional study was carried out in Al Tarmiyah district from February to July 2023. 150 mothers attending Al Tarmiyah hospital and a conveniently selected number of primary health care centers in the district were directly interviewed using a questionnaire. The collected data was analyzed using statistical package for social sciences (SPSS) version 26. P value of less than 0.05 was considered significant. **Results:** A total of 150 mothers were included, 49.3% had average knowledge regarding administration of pediatric liquid dosage forms. Many mothers were unaware of the correct measurements of household spoons, the appropriate time for keeping reconstituted oral suspension, the duration of giving therapy, and the correct time for giving treatment in relation to meals. The study also found that 65.3% of mothers had average practice in administering medications to their children. There was no significant difference between knowledge and practice. Higher education and being employed were associated with average knowledge and the average practice was significantly associated with secondary level of education, being an employed mother and lower family number. **Conclusion:** this study revealed that about half of the interviewed mothers had poor knowledge regarding administration of pediatric liquid dosage forms. And (65.3%) mothers have an average practice. The study recommended that there is a need for health education campaigns to raise awareness among mothers about pediatric liquid dosage forms. Involving pharmacists in providing sufficient and accurate information to caregivers and using mass media to educate the public and increase awareness on this crucial topic.

Keywords: pediatric, liquid dosage, knowledge, practice.

Introduction

Oral liquid medications are commonly prescribed to children⁽¹⁾. As they are the most age-appropriate drug form at this age group who are unable to swallow tablets or capsules Infants and children should receive the right doses of liquid formulations so that they get optimum dose for therapy without the risk of exposure to undue toxicity^(2,3) as any medication errors may contribute toward treatment failure, development of antimicrobial resistance, or even harm to the child⁽⁴⁾.

To ensure accurate dosage of the drug prescribed, there are many measuring devices used to measure oral liquid medications, such as cups, droppers, household spoons, and syringes. All of these devices are used with varying levels of accuracy⁽⁵⁾.

The method by which parents measure liquid medications for children is potentially problematic. The volume of household spoons varies, potentially leading to errors in dosing⁽⁶⁾. Several mothers make errors in measuring the drug volumes, and this is dependent on the measuring device used and on health literacy^(7,8).

Good knowledge of the mothers about oral liquid medications is helpful in reducing the problem of medication dosing errors so the present study is carried out to determine the knowledge and practice of mothers regarding administration of pediatric liquid dosage forms in Al Tarmiyah which is a rural district and to determine the most preferred measuring device.

It is hoped that the study results would be useful in planning corrective and educational strategies if needed, aim of this study to assess the knowledge and practice of mothers regarding pediatric liquid medicine administration in Al Tarmiyah district.

Subjects and Methods: A cross-Sectional study was conducted at Al Tarmiyah h primary healthcare center and Al Tarmiyah h general hospital in Baghdad city/Al-Karkh which include(Al-Tarmiyah primary healthcare center ;Al-Abichy primary healthcare center ; Al-Taby primary healthcare center and Al-Mishahda healthcare center), Collection of data extended over a period of 3 months from (March to May) 2023 .

A convenient sample size of 150 mothers who were attending the chosen primary healthcare center and Al-Tarmiyah general hospital, during routine visits for regular checkup

and vaccinations of their children, or for pediatrics consultation during the study period was interviewed.

Inclusion criteria: The targeted population includes all mothers (being the direct caregiver to a child) with a child or more who are under the age of 15 years of both genders and who are willing to participate, as well as Mothers who completed the interview.

Data was collected using a questionnaire, which was validated by community and family medicine specialists and was pre-tested by the pilot study,

The questionnaire composed is of two main sections; Section one: socio-demographic variables related to mother and child; child age, gender, number of children, mother age, education, occupation. and Section two: consist of 17 questions which sub divided into two parts:

1. Nine questions related to mother's knowledge about measuring devices measured, time of keeping reconstituted oral suspension, duration of giving therapy, time of giving therapy, mother's information about when and how often giving treatment.
2. Eight questions related to mother's practice about child vomits drug, expiratory.

Date of medicine, child refusal to take medicine, type of fluid used for reconstitution liquid drugs, type of measuring devices.

Statistical analysis

Microsoft Excel 2016 and IBM SPSS version 26 were used for data entry and analysis. Descriptive statistic was used in form of frequencies and percentage for categorical data. While mean was used for quantitative data that is normally distributed, represented by figures and tables. For qualitative variables, chi-square test (or fisher's exact test) was used. $P < 0.05$ was determined as statistical significance.

Answers were given 1 point for correct response and zero point for wrong response. Total score of $< 50\%$ considered as poor knowledge or practice, score = 50-75% considered as average knowledge or practice, while score $> 75\%$ considered as good knowledge or practice.

Ethical consideration: Formal approval was taken from the scientific committee of the Arabic board of family medicine, from Alkarkh directorate, from primary health care center sector and Al Tarmiyah general hospital in Baghdad city/Alkarkh (present in appendix). Verbal consent was taken from all mothers who participate after explaining the aim of the study.

Pilot study: A pilot study was carried out on 8 mothers (who were not included in the study) before data collection in order to estimate the time needed to collect the required data and make

sure that the questions are understandable by the mothers and if any changes should be made.

Results

Sociodemographic data and past experience of participants

A total of 150 mothers were included in the study, mean age of their children was 3.16 ± 2.92 years. Thirty-two percent of the children were toddlers, 29.3% were newborn and infant, 24% were preschool ages, and 14.7% were school age children. Males formed 62% of the total children while females formed 38%.

According to the mothers; 55.3% of them were within age group 20-29 years and 30% were within age group 30-39 years; 59.3% of them have 1-2 children, 27.3% of them have 3-4 children, and 13.3% have 5 children or more.

Education of mother was college among 48% of them and primary school among 28.7%. About 47.3% of mother were employed while 52.7% of them were housewives; and 55.3% of the mother residency was central Al Tarmiyah h while 44.7% of them living in the peripheral Al Tarmiyah h. In addition, 85.3% of them have past experience in giving child liquid medication **Table -1**.

Table (1): Sociodemographic data and past experience of participants

Sociodemographic data		No.	%
Age Group of children	Newborn and Infant (0-12 months)	44	29.3
	Toddler (>1-3 years)	48	32.0
	Preschool age (4-6years)	36	24.0
	School age (>6-12years)	22	14.7
Gender of children	Male	93	62.0
	Female	57	38.0
Number of children	1-2	89	59.3
	3-4	41	27.3
	≥ 5	20	13.3
Age of mother/years	20-29	83	55.3
	30-39	45	30.0
	40-49	22	14.7
Education of mother	Illiterate	7	4.7

	Primary	43	28.7
	Secondary	21	14.0
	College	72	48.0
	Higher education	7	4.7
Occupation of mother	Employed	71	47.3
	Housewife	79	52.7
Residency	Central Tarmiya	83	55.3
	Peripheral Tarmiya	67	44.7
Past experience in giving child liquid medication		128	85.3
Total		150	100

Knowledge of mothers regarding administration of pediatric liquid dosage forms

According to the mothers knowledge; 90.7% of them thought that one teaspoon measurement equal to 2.5 cc; 90.0% of them thought that one tablespoon measurement equal to 5 cc; 79.3% keeping reconstituted oral suspension for 7 days; 67.3% of them fed the residual quality of liquid dose left in measuring device after washing it; 84.0% of them given the medicine for 5 days if duration of therapy is 5 days; 51.3% of them giving the treatment prescription 15 minutes before eating; 47.3% of them giving the treatment prescription 15 minutes after eating **Table -2**.

Regarding mothers' information about when and how often the treatment is given; 79.3% of them selected **8 pm** for the second dose if the medicine is twice a day and the first dose was at eight in the morning; 69.3% of them selected **4 pm** for second dose if the medicine is three times a day and the first dose was at eight in the morning; and 74.7% of them selected **2 pm** for second dose If the medicine is four times a day and the first dose was at eight in the morning **Table -2**.

Table (2): Knowledge of mothers regarding administration of pediatric liquid dosage forms

Knowledge	No.	%	
One teaspoon measurement:	2.5 cc	136	90.7
	5 cc	14	9.3
	7 cc	0	0.0
	10 cc	0	0.0
One tablespoon measurement:	5 cc	135	90.0
	7cc	3	2.0
	10 cc	2	1.3
	15 cc	10	6.7
The time of keeping reconstituted oral suspension is	Kept for 7 days	119	79.3
	Kept for ≥ 15 days	4	2.7
	Kept till phial empty	11	7.3
	Kept till phial expired	3	2.0
	I don't know	13	8.7
The residual quality of liquid dose left in measuring device is	Fed after washing the device	101	67.3
	Scooped by finger and fed	10	6.7
	I don't know	39	26.0
Medicine given if duration of therapy is 5 days	5 days	126	84.0
	Until child get better	21	14.0
	I don't know	3	2.0
The time of giving the treatment if prescription is before eating duration (minutes before a meal)	15 min	77	51.3
	30 min	58	38.7
	60 min	6	4.0
	I don't know	9	6.0
The time of giving the treatment if prescription is after eating duration (minutes after meal)	15 min	71	47.3
	30 min	55	36.7
	60 min	14	9.3
	I don't know	10	6.7
If the medicine is twice a day and the first dose was at eight in the morning, then the second dose is:	At 4 PM	10	6.7
	At 8 PM	119	79.3
	I don't know	21	14.0
If the medicine is three times a day and the first dose was at eight in the morning, then the second dose is:	At 4 PM	104	69.3
	At 12AM	12	8.0
	I don't know	34	22.7
If the medicine is four times a day and the first dose was at eight in the morning, then the second dose is	At 2 PM	112	74.7
	At 4 PM	6	4.0
	I don't know	32	21.3
Total	150	100.0	

Distribution of sociodemographic data according to the Knowledge of mothers was elucidated in the **Table-3**. Average knowledge was significantly dominant among higher education and employed mothers, while illiteracy and mothers without job showed poor knowledge, $P < 0.001$.

Table (3): Distribution of sociodemographic data according to the Knowledge of mothers regarding administration of pediatric liquid dosage forms

Sociodemographic data		Knowledge				P* value
		Poor knowledge		Average knowledge		
		No.	%	No.	%	
Age Group	Newborn and Infant (0-12months)	28	63.6	16	36.4	0.23
	Toddler (1-3 years)	21	43.8	27	56.3	
	Preschool age (4-6years)	17	47.2	19	52.8	
	School age (>6-12years)	10	45.5	12	54.5	
Gender	Male	47	50.5	46	49.5	1
	Female	29	50.9	28	49.1	
Number of children	1-2	39	43.8	50	56.2	0.086
	3-4	23	56.1	18	43.9	
	≥5	14	70.0	6	30.0	
Education of mother	Illiterate	6	85.7	1	14.3	<0.001
	Primary	33	76.7	10	23.3	
	Secondary	14	66.7	7	33.3	
	College	22	30.6	50	69.4	
	Higher education	1	14.3	6	85.7	
Occupation of mother	Employed	22	31.0	49	69.0	<0.001
	Housewife	54	68.4	25	31.6	
Age of mother/years	20-29	37	44.6	46	55.4	0.16
	30-39	28	62.2	17	37.8	
	40-49	11	50.0	11	50.0	
Residency	Central	43	51.8	40	48.2	0.87
	Peripheral	33	49.3	34	50.7	
Past experience about medication	Yes	64	50.0	64	50.0	0.81
	No	12	54.5	10	45.5	

**Chi² or Fishers Exact Test*

Practice of mothers regarding administration of pediatric liquid dosage forms

All mothers (100%) washed the device after use. Half of them (54.7%) Wait for some time, then try again to give her child the medicine if the child vomits it. Ninety-eight percent of mothers check the expiratory date on the medicine. Thirty-eight percent of mothers fed the child forcefully if he/she refuse to take the medicine, while 28% of them added it to the milk and fed.

For suspension fluid, 54% of mothers' use drinking water for reconstitution. The measuring device that used for the medication was Syringe (43.3% of mothers), Teaspoon (25.3% of mothers), and Calibrated spoon (22.7% of mothers). Sixty-four percent of them thought that the medicine can be measured accurately with those devices **Table-4**.

Table (4): Practice of mothers regarding administration of pediatric liquid dosage forms

Practice of mothers		No.	%
Is feeding device washed after use?		150	100
What should be done if child vomits medicine?	Medicine given again immediately	5	3.3
	Wait for sometime, then try again	82	54.7
	Medicine stopped	63	42.0
Do you check the expiratory date on the medicine?		147	98.0
Storage medicine in:	Fridge door	117	78.0
	Refrigerator	4	2.7
	Over cabinet	29	19.3
	Others	0	0.0
Course of action in case of refusal to take medicine:	Added to milk and fed	42	28.0
	Further dilution for dose done	2	1.3
	Kept for next dose	16	10.7
	Fed forcefully	57	38.0
	Fed after sometime	33	22.0
	Others	0	0.0
For suspension fluid used for reconstitution is:	Boiled water	18	12.0
	Drinking water	81	54.0
	Bottled water	2	1.3
	Reconstituting fluid supplied	26	17.3
	Others	23	15.3
What is the measuring device do you used for the medication?	Calibrated spoon	34	22.7
	Teaspoon	38	25.3
	Syringe	65	43.3
	Measuring cup	9	6.0

	Dropper	1	0.7
	Bottle cap	3	2.0
	Direct sip from bottle	0	0.0
Why are you using the above measuring device?	The medicine can be measured accurately with the device	96	64.0
	It is easy to find the device at home	15	10.0
	Device is easy to use	18	12.0
	Device reduces risk of spilling the medicine	21	14.0
Total		150	100

Distribution of sociodemographic data according to the Practice of mothers regarding administration of pediatric liquid dosage forms was shown in **Table -6** and revealed that average practice was significantly dominant among mothers of 1-2 children, with secondary level of education, and with employed mothers, ($P=0.009$, $P=0.005$, and $P=0.007$) respectively.

Table (5): Distribution of sociodemographic data according to the Practice of mothers regarding administration of pediatric liquid dosage forms

Sociodemographic data		Practice of mothers						P* value
		Poor practice		Average practice		Good practice		
		No	%	No	%	No	%	
Age Group	Newborn and Infant(0-12months)	5	11.4	24	54.5	15	34.1	0.34
	Toddler (1-3 years)	4	8.3	33	68.8	11	22.9	
	Preschool age 4-6Years	6	16.7	25	69.4	5	13.9	
	School age>6-12Yrs	3	13.6	16	72.7	3	13.6	
Gender	Male	12	12.9	60	64.5	21	22.6	0.93
	Female	6	10.5	38	66.7	13	22.8	
Number of children	1-2	4	4.5	63	70.8	22	24.7	0.009
	3-4	11	26.8	22	53.7	8	19.5	
	≥5	3	15.0	13	65.0	4	20.0	
Education of mother	Illiterate	2	28.6	4	57.1	1	14.3	0.005
	Primary	10	23.3	23	53.5	10	23.3	
	Secondary	3	14.3	17	81.0	1	4.8	
	College	3	4.2	51	70.8	18	25.0	
	Higher education	0	0.0	3	42.9	4	57.1	
Occupation of mother	Employed	3	4.2	54	76.1	14	19.7	0.007
	Housewife	15	19.0	44	55.7	20	25.3	

Age of mother/years	20-29	6	7.2	55	66.3	22	26.5	0.16
	30-39	7	15.6	31	68.9	7	15.6	
	40-49	5	22.7	12	54.5	5	22.7	
Residency	Central	9	10.8	57	68.7	17	20.5	0.66
	Peripheral	9	13.4	41	61.2	17	25.4	
Past experience about medication	Yes	13	10.2	85	66.4	30	23.4	0.28
	No	5	22.7	13	59.1	4	18.2	

**Chi² or Fishers Exact Test*

Association between mothers' knowledge and Practice regarding administration of pediatric liquid dosage forms

No significant difference between knowledge and practice of mothers regarding administration of pediatric liquid dosage forms, $P=0.065$; as shown in **Table-6**.

Table (6): Association between mothers' knowledge and Practice regarding administration of pediatric liquid dosage forms

Variable		Knowledge				P* value
		Poor knowledge		Average knowledge		
		No.	%	No.	%	
Practice	Poor practice	13	72.2%	5	27.8%	0.065
	Average practice	50	51.0%	48	49.0%	
	Good practice	13	38.2%	21	61.8%	

**Chi² or Fishers Exact Test*

Discussion

Children and adults may require the same medication for the same illness, but using medications in children is sometimes more difficult, since children are not miniature people. The frailty of children, particularly babies, underscores the unique necessity in pediatric medicine⁽⁹⁾. In comparison to the adult population, a minor dose mistake causes enormous damage in children. According to reports by world health organization (WHO), more than 40% of caregivers make mistakes while giving liquid medicine in children⁽¹⁰⁾. Liquid formulations such as syrups, solutions, and suspensions are widely recommended and are the preferred oral formulation for children due to the addition of pleasant-tasting excipients, making them more palatable^(9&11).

This study included 150 mothers, more than half of whom were between the ages of 20 and 29, and around one-third of them were between the ages of 30 and 39. Only about half of the mothers were employed. These findings were consistent with those of Bakhtiar and Li⁽¹²⁾. in Malaysia, who found that (32.3%) of the chosen sample was between the ages of 31 and 35. And (49%) of them were employed. However, this is in contrast to a Palestinian study conducted by Ali et al.,⁽¹³⁾, in which (42.9%) were between the ages of 30 and 39 and (80.2%) were unemployed. The difference between this study and the study by Ali et al.,⁽¹³⁾. might be attributed to economic and national differences, since the study by Ali et al.,⁽¹³⁾. was conducted in Palestine Concerning the level of education, approximately two-thirds of the selected sample had a secondary or a higher level of education, which differed from two other studies in Malaysia, the first one by Norizan et al.,⁽¹⁴⁾. where (92%) had a secondary or higher level of education, and the second was by Bakhtiar and Li⁽¹²⁾. where (93.6%) had a secondary or higher level of education.

The difference between the two studies and the current study may be due to the fact that this study included only females while the other studies included males and females, where males have a greater chance and more demands to improve their education level.

One-third of the mothers' children in the selected sample were under the age of twelve months. And around two-thirds of them were males. These findings were consistent with a South African study that was done by Bezuidenhout et al.,⁽¹⁵⁾. who found that (25.0%) of the children were less than ten months old. And (56.2%) of them were males.

In terms of knowledge, only (9.3%) and (6.7%) of the selected sample correctly identified the teaspoon and tablespoon measurement as being equivalent to five and fifteen cubic centimeters (cc), respectively. (2.7%) responded that the length of reconstituted drug storage was greater than or equal to fifteen days. These findings agreed with those obtained in an Indian study conducted by Sil et al.,⁽¹⁶⁾. where (11.5%) knew a tablespoon was equal to fifteen cc, (9.8%) kept the reconstituted medicine for 15 days or more. This may be due to the fact that household spoons are inconsistent in size.

Less than half of the mothers in this study said the time that was required before meals is thirty minutes or sixty minutes if the prescription of the medicine was recommended before meal, while (9.3%) indicated the time that was required after meals was an hour if the drug was prescribed after meal. These findings agreed with those obtained in a study done by Sil et al.,⁽¹⁶⁾.in India. where (39.3%) of the mothers said that "before meal" meant at least 30-60 minutes before; and (6.63%) of them said that "after meal" meant an hour after the last meal. The similarity between the current study and the study by Sil et al.,⁽¹⁶⁾. may be due to the same

quality of thinking considering the majority in the study by Sil et al.,⁽¹⁶⁾ were from a rural area.

In the current study, it was showed that average knowledge was significantly associated with higher education, which was consistent with others studies, the first one was conducted by Bakhtiar and Li⁽¹²⁾ in Malaysia who observed that parental education background significantly affects parental understanding of liquid medications among children, respondents with a higher education level had a greater knowledge of liquid medications in terms of comprehending the medium used to reconstitute oral antibiotics, liquid medication doses in children, measurement, and liquid medication storage. The second consistent study was done by Esteireiro et al.,⁽¹⁷⁾ in Portugal, which discovered a statistically significant link between education (OR=3.42) and respondents' degree of knowledge. The third was a Malaysian study, by Yong et al.,⁽¹⁸⁾ discovered that the mother's education level had a significant relationship with knowledge level. This may be explained by the fact that the higher the education level becomes, the greater the chances are to obtain information from the proper sources, like medical field workers or even the world wide web, making them match the facts to reach a more accurate understanding of liquid medications.

The current study observed that average knowledge was significantly dominant among employed mothers, this may be explained by the fact that employed mother may have some degree of education.

In this study a total of (29.3%) of the mothers only stated that the vehicles used for powder medicine reconstitution were boiled water or using the reconstitution fluid given with the medication, most of the mothers used drinking water. In contrast to a Palestinian study by Al-Ramahi et al.,⁽¹⁹⁾ where (77.3%) of caregivers employ an appropriate vehicle to reconstitute dry powder antibiotics (75.5%) boiled then cooled tap water and (1.8%) distilled water). The difference between the current study and the study by Al-Ramahi et al.,⁽¹⁹⁾ may be due to the fact that (76.8%) of them lived in the city while our study was done at Tarmiya and about half of them lived at peripheral regions of Tarmiya,

This study revealed that average practice was dominant among mother with 1-2 children. This may be explained by the fact that the possibility of a smaller family size could be an indicator of a higher degree of family education, in addition to that, as the number of children decreases, the focusing would be increased.

Finally, the present study showed that average practice was also significantly associated with secondary level of education and being an employed mother, which was in line with a Malaysian study by Bakhtiar and Li⁽¹²⁾ where parents with a higher education level had

considerably a better practice in terms of selecting dosage equipment for measuring liquid medicine in children, in addition to that, educated people are more likely to seek medical advice and information and implement them.

Conclusions:

1. About 50.7% of mothers have poor knowledge regarding administration of pediatric liquid dosage forms.
2. 65.3% of mothers have an average practice regarding administration of pediatric liquid dosage.
3. Average knowledge was significantly dominant among higher education and employed mothers.
4. Average practice was significantly associated with secondary level of education, being an employed mother and lower family number.
5. There is no significant difference between knowledge and practice of mothers regarding administration of pediatric liquid dosage forms.

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