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Factors affecting maternal initiated medication practices among Sinhala speaking mothers for preschool children in Godakanda (East) and Uluvitike areas, Galle, Sri Lanka

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Abstract

Introduction: Maternal initiated medication practices for children frequently involve over-the-counter, traditional and herbal medicines that may be inappropriate and not evidence-based.

Objectives: To identify factors affecting self-medication practices among Sinhala speaking mothers of preschool children in Godakanda (East) and Uluvitike areas, Galle, Sri Lanka.

Methodology: The study consisted of a survey questionnaire, a qualitative study, and a contrived observational study. Two public health midwifery (PHM) areas were selected to conduct the study. Stratified random sampling was used to select 400 mothers from two PHM areas for both questionnaire survey and contrived observational study. Purposive sampling was used to select mothers for the qualitative study.

Results: The prevalence of maternal initiated medication of the children aged between 1 to 5 years of age in the study area was 77.4%. The age of the index child is significantly higher in the group of mothers who have not done maternal initiated medication than the group of mothers who have medicated the index child by themselves ($p=0.01$). The frequency of maternal initiated medication was significantly higher for younger children than older children ($p=0.01$). Types of medicine used for maternal initiated medication were independent of socio-demographic factors. Most of the mothers obtained medicines from a pharmacy without prescriptions (68.6%). Mothers with a higher level of education ($p=0.008$) and higher income ($p<0.001$) were significantly more likely to follow professional information sources than autonomous sources when they practice maternal initiated medication.

The qualitative study reported that factors affecting mothers' perceptions and attitudes towards mother initiated medication included: previous experiences, perceived idea of formal health care services, perceived impact of illness on the child and family, external influences, understanding of benefits and risks of maternal initiated medication, perceived impact of illness on the child and family. Perceptions assessed include adverse events of pharmaceuticals, toxicity of

pharmaceuticals to child's body which contributed to noncompliance with the drug therapy and influenced the mother to use traditional or herbal medicines widely for their children.

The contrived observational study suggested, only 26.9% of mothers could correctly decide and measure doses of paracetamol within the acceptable range. The rest of the mothers made at least one error in either dose determining or measurement. Only 35.4% of mothers made actual measured doses in acceptable dose range and 55.8% of mothers made small errors. Of all 353 mothers, significantly higher percentage of mothers measured acceptable doses by using 10 ml syringe (88.4%) with compared to measuring cup (60 .6%) ($p < 0.0001$, CI=21.5 - 33.7) and calibrated spoon (26.1%) ($p < 0.0001$, CI=56.1 - 67.5).

Conclusions: The prevalence of mother initiated medication for children aged 1 to 5 years of age was higher among the study area. Mothers require healthcare professionals' guidance when recognizing illnesses, selecting treatment options and correctly determine and measuring doses of over the counter medicines for young children.

Introduction

Young children are commonly afflicted by respiratory tract infections, diarrhoea and other self-limiting illnesses. Usually parents administer drugs for these diseases without seeking professional advice (Nazir et al., 2015, Tsifiregna et al., 2016, Kariyawasam et al., 2005). It was found that children and adolescents around the world are vulnerable to receiving over-the-counter medicines (OTC), traditional and herbal medicines that are generally not evidence-based and inappropriate (WHO, 2007).

Self-medication is one of the major areas which require attention since parents are the decision-makers for the treatment for their child. Inadequate knowledge and insufficient information on the use of medicines may lead to masking of symptoms, aggravating the disease or cause adverse drug events among self-medicating children (Choonara et al., 1996, Macdonald, 2002, De Silva et al., 2017). Hence it is important to identify possible medicine-related problems affecting children when they are receiving self-medication.

Thus, the aim of this study was to find the associations between the use of maternal initiated medication and socioeconomic status of mothers who have children aged between one to five years, to explore mothers' attitudes and perceptions of maternal initiated medication use for children and to assess the accuracy of dosing practices of child medications among mothers.

Methodology

A cross-sectional descriptive study was conducted in two PHM areas; Godakanda (East) and Uluvitike, Galle, Sri Lanka by using three different study components including interviewer-administered questionnaire, focus group discussions and contrived observational study. Ethical approval was obtained from the Ethical Review Committee, Faculty of Medicine, University of Peradeniya (2016/EC/08).

Questionnaire survey

The interviewer administered questionnaire was used to collect basic demographic data from the participants and to find the associations between the use of maternal initiated medication and the socio-economic status of mothers. For the questionnaire survey, the sample size was calculated based on proportion in a single cross-sectional survey and resulted in 400 participants including 10% of non-respondent rate (Gorstein et al., 2007). Participants were randomly selected based on the proportion allocation in which the distribution of the mothers who have aged between 1 to 5 years children in each PHM area. Study participants were individually visited and data collection was done by the researcher.

Qualitative study

Purposive sampling was used to select participants and they were divided into 2 groups based on their socioeconomic background including professional mothers and non-employed or non-professional workers. Focus group discussions (FGDs) were conducted. The completion of the data collection and the resulting sample size was determined by the concept of data saturation. Group discussions were audio-recorded and transcribed after conducting FGDs for future analysis

Contrived observational study

This contrived observational study was conducted parallel to the questionnaire survey. Hence the same sample size and sampling method described in questionnaire survey was used. The researcher observed how mothers determine and measure one of the common over the counter medicine, paracetamol for the index child and how mothers used the commonly available liquid measuring devices by introducing two scenarios.

Scenario 1: This was used to explore the accuracy of dose measurement of over the counter medication for children. Mothers were asked to decide and measure the appropriate dose of paracetamol to index child if the child has fever (body temperature at 38^oC or 100.4^oF). Participant's preferable dosage forms were provided and mothers were allowed to use any measuring device they normally use for measuring liquid paracetamol for their index child.

Scenario 2: This was used to assess the accuracy of oral liquid measuring devices and thus identifying the best liquid measuring device for household usage. In this scenario, mothers were asked to measure 5ml paracetamol (acetaminophen) liquid formulation (Panadol® 120 mg/5 mL) by using the three different liquid measuring devices including measuring cup (included with children's' Panadol® liquid formulation; GlaxoWellcome Ceylon Limited, Sri Lanka; 10 mL), calibrated spoon filled to edge (included with Amoxicillin oral suspension BP 125mg/5mL, Belcopharma, Bahadurgarh, India; 5 mL) and 10 cc syringe (10 mL syringe manufactured by Changzhou Medical appliances, General factory CO, LTD, Changzhou City, Jiangsu Province, China). The volume of acetaminophen contained within measuring cup, calibrated spoon was measured by using a 10 mL syringe. The volume of acetaminophen contained within the 10 mL syringe was assessed by using the calibration on the syringe itself after eliminating visible air bubbles.

The actual dose measured by the caregiver was then evaluated by the researcher for accuracy. The researcher collected measured solid (tablet) doses to polyethylene bags followed by labeled and sealed. Those were weighted by using Sartorius analytical balance (Germany) and weights were recorded.

Deviations of the measured dose of paracetamol from the respective correct dose was calculated as follows for the tablet and liquid dosage forms of paracetamol. For tablet dosage form, it was done by comparing the weight of the paracetamol contained in measured tablet sample with correct paracetamol weight according to the child's weight. For liquid dosage form, measured liquid doses were compared with the reference dose table accompanied by children's' Panadol@ 120mg/5ml liquid formulation; GlaxoWellcome Ceylon Limited, Sri Lanka. For the analysis, all the measurements presented as milligrams.

Decision error: Deviation of decided dose more than $\pm 10\%$ from the correct dose was considered as "decision error".

Measuring error: The deviation of measured dose more than $\pm 10\%$ of the decided dose was considered as "measuring error".

Actual dose measured: Final outcome of dose measurements made by mothers.

Data analysis

SPSS 16.0 software and MedCalc version 18.2.1 was used to analyze quantitative data and thematic analysis was used to analyze qualitative data.

Results

Questionnaire survey

The responding rate of the study was 88.3% (n=353). The prevalence of maternal initiated medication among mothers of young children of age between one to five years in Godakanda (East) and Uluvitike PHM areas was 77.4% (68.4to 87.1% for 95% CI).

It was observed that the age of the index child was significantly higher in the group of mothers who haven't done maternal initiated medication compared to the group of mothers who have initiated treatment by themselves ($U=2547.5$, $p=0.01$) (Table 1). Results revealed that the frequency of maternal initiated medication was significantly associated with the age of the index child ($\chi^2=9.9$, $p=0.01$). The age of the index child of mothers who went for a physician was significantly higher than the age of the index child who received maternal initiated medication only one time ($\chi^2=9.9$, $p=0.01$) (Table 1).

Table 1: Association between the use of maternal initiated medication and socio-demographic factors

Socio-demographic factors	Components of maternal initiated medication			
	Prevalence of maternal initiated medication (p value)	Frequency of maternal initiated medication (p value)	Types of maternal initiated medication (p value)	Most frequently used source of information (p value)
Level of education	0.2*	0.3*	0.6*	0.008*
Number of children in the family	0.2*	0.2*	0.3*	0.7*
Total monthly income of the family	0.1 [‡]	0.1**	0.3**	0.03[‡]
Age of the index child	0.01[‡]	0.01**	0.1**	0.8 [‡]

Results were based on 273 mothers who self-medicated the index child proceeding last three months.

* Based on the results of χ^2 test, ** Based on the results of Kruskal-Wallis test, [‡] Based on the results of Mann-Whitney test, $p < 0.05$ is considered as statistically significant.

Paracetamol (n=199, 72.8%) and chlorpheniramine (n=104, 38.0%) was the most common non-prescription medicine used for the index child. Salbutamol (n=11, 4.0%) was the predominant prescription-only medicine and coriander (*Coriandrum sativum*) (n=74, 27.1%) was the most common traditional medicine used by mothers. None of the socio-demographic factors significantly associated the types of maternal initiated medication used for their index child (Table 1).

The majority of mothers who frequently sought information from professional sources before medicate the index child had higher level of education (42.3%) and only 20.5% of mothers who had lower level of education sought information from professional sources before medicate the index child. The results showed that the level of education was significantly associated with frequently sought information source by the respondents ($\chi^2=0.4$, $p=0.008$) (Table 1).

Several reasons were influenced for maternal initiated medication in the study area and those were summarized in the Table 2.

Table 2: Reasons for maternal initiated medication

Reason	Number of mothers (%)
Symptoms were mild	137 (50.2)
It is not good to use medicines given by doctors frequently for children since they are more toxic	55 (20.1)
Previous experience with similar symptoms	24 (8.8)
To control the symptoms until meet physician	25 (9.2)
Financial or time constrain for consulting a physician	20 (7.3)
Doctor recommended to repeat the medication if similar symptoms arise	7 (2.6)
Child do not like to take medicines and physician prescribe number of medicines	5 (1.8)
Total	273 (100)

Qualitative study

Three focus group discussions with twenty eight mothers were required to reach the data saturation point. Eight mothers were educated on or below the ordinary level while eleven participants were educated up to advanced level. Nine mothers had degree or diploma qualifications. The participants have consisted of twelve professional working mothers, one non-professional worker and fifteen non-working mothers. Five themes were identified during the analysis. Three themes were emerged related to mothers' attitudes and perceptions of maternal initiated medication for children.

Maternal initiated medication was perceived as a first step in the attempt to solve child illnesses

Results suggested that mothers sought medical advice for their children only after maternal initiated medication fails or symptoms persist. Mothers used symptoms based evaluation of child's diseases. Mothers may select maternal initiated medication or medical advice depending on the type of health problem, the familiarity of the health problem, disease severity and child's susceptibility to diseases.

Role of traditional and herbal medicines in maternal initiated medication

Among the different kinds of medicines used for maternal initiated medication, mothers prominently discussed traditional and herbal medicines. During the discussion, for the term of maternal initiated medication, most mothers referred traditional and herbal medicines than the over the counter medicines. The majority of mothers had positive attitudes towards traditional and herbal medicines and it led them to use traditional and herbal medicines for child's illnesses before seeking medical advice.

Factors affecting mothers' attitudes and perceptions of maternal initiated medication

Those were including; the role of past experiences, perceived idea of formal healthcare services, perceived impact of illness on the child and family, external influences, understanding of benefits and risks of self-medication, perceived impact of illness on the child and family.

There were two new themes that emerged from the discussions and those were not directly related to the mothers' attitudes and perceptions of maternal initiated medication.

Mothers' awareness, experiences and behavior with respect to adverse events.

The theme was divided into three subthemes including;

- Experiences and awareness about adverse events
- Mothers' behavior with respect to adverse events of the child's medication
- Mothers' awareness of drug interactions

Medicines information seeking behavior of mothers

Results revealed that the use of maternal initiated medication was not blindly done and most of the mothers actually sought information of medicines when they self-medicate the child. The theme reveals that medication information seeking behavior was varying among individuals and sought different types of information on the child's medications from different sources.

Contrived observational study

Mothers' ability to decide and measure doses

All the participants (n=353) of the study were included in this study. Among them, 78.5% (n=277) of mothers used paracetamol 120 mg/5 mL liquid dosage form for the index child while the rest of the participants used paracetamol tablet 500 mg.

Among all 353 participants, mothers who made both deciding and measuring doses of paracetamol within the acceptable range was only 26.9% (n=95). The majority of participants made both types of errors together (32.0%). Only decision errors were made by 26.6% mothers and most of the errors were sub-therapeutic dose (22.9%). Among the participants who made only measuring errors (14.4%), a slightly higher percentage of those errors were sub-therapeutic doses (7.9%).

The median of the decision error made by mothers was -18.0 mg (IQR, -36.3 to 0.75) while the median decision error was 0mg (IQR, -14.4 to 15.4). Since both decision and measuring accuracy were contributed to the final outcome of dose measurements taken by mothers, the actual dose measured in scenario one was also assessed and the median error of actual measured dose was -18 mg. Results suggested that the accuracy of actual measured dose was not significantly associated with the level of education. Only 35.4% of mothers actually measured the acceptable dose while the majority of mothers made small errors (deviations from $\pm 11\%$ - $\pm 40\%$ from the correct dose) (55.8%). However, there were twenty five mothers (8.8%) who made large errors ($>\pm 40\%$ of the correct dose) during the scenario one.

Of 353 mothers, there was no significant association was observed between them and accuracy of actual measured dose and level of education ($\chi^2=7.2$, $p=0.1$), the total number of children in the family ($\chi^2=1.0$, $p=0.6$), total monthly income ($\chi^2=4.0$, $p=0.1$) and age of the index child ($\chi^2=2.6$, $p=0.2$).

Accuracy of the oral liquid medicine device

The mean of the measurements taken by the mothers using measuring cup, calibrated spoon and 10 mL syringe was 4.9 ± 0.68 mL, 4.0 ± 0.58 mL, and 4.9 ± 0.33 mL respectively. The median of the measurements taken by mothers using measuring cup, calibrated spoon and 10 mL syringe was 5 mL (IQR, 4.4 to 5.2), 4 mL (IQR, 3.8 to 4.6) and 5 mL (IQR, 4.8 to 5.0) respectively. Of all 353 mothers, significantly higher percentage of mothers measured acceptable doses by using 10 mL syringe (88.4%) with compared to measuring cup (60.6%) ($p < 0.0001$, CI=21.5 - 33.7 and calibrated spoon (26.1%) ($p < 0.0001$, CI= 56.1 - 67.5) (Table 3).

Table 3: Accuracy of oral liquid medicine devices among the respondents

Accuracy of oral liquid medicine devices	Measuring cup	Calibrated spoon	10 mL Syringe
Number of mothers who made acceptable dose (%)	214 (60.6)	92 (26.1)	312 (88.4)
Small error (%)	136 (38.5)	258 (73.0)	41 (11.6)
Number of mothers who made sub-therapeutic dose (-11% to -40% of correct dose) (%)	93 (26.3)	255 (72.2)	37 (10.5)
Number of mothers who made supra-therapeutic dose (11% to 40% of the correct dose) (%)	43 (12.2)	3 (0.8)	4 (1.1)
Number of mothers who made large error (%)	3 (0.8)	3 (0.8)	0 (0.0)
Number of mothers who made sub-therapeutic dose (< -40% of correct dose) (%)	0 (0.0)	3 (0.8)	0 (0.0)
Number of mothers who made supra-therapeutic dose (> 40% of the correct dose) (%)	3 (0.8)	0 (0.0)	0 (0.0)
Total (%)	353 (100)	353 (100)	353 (100)

Discussion

The result represents a high prevalence of maternal initiated medication in the study area with compared to previous studies conducted in different communities in Sri Lanka as well as lower and middle-income countries (Kariyawasam et al., 2005, Wijesinghe et al., 2012, Salami and Adesanwo, 2015, Alele, 2013). The study showed that young children were more prone to receive maternal initiated medication than older children and independent with other socio-demographic factors. Previous studies reported that level of education, monthly income, maternal employment status, private health insurance, and more than one child in the family is significantly associated with self-medication (Alele, 2013, Nazir et al., 2015, Tsifiregna et al., 2016, Trajanovska et al., 2010). The results indicated that frequency of maternal initiated medication proceeding three months of the period was significantly associated with age of the index child ($p=0.01$). It is difficult to estimate reasons for these findings, however, it might be due to children factor including child's health, susceptibility to illness, the severity of disease or disease type (Siponen, 2014, Maiman et al., 1982, Nazir et al., 2015, Ecklund and Ross, 2001). Both pharmaceuticals and traditional or herbal medicines were used by mothers for maternal initiated medication their children. Despite the age, use of pharmaceuticals and traditional or herbal medicines for self-medication is a common practice among Sri Lankans (Kariyawasam et al., 2005, Wijesinghe et al., 2012). Use of antibiotics and other prescription only medicines were rare among the study participants. In contrast international studies reported high prevalence of antibiotic use for children without consulting a physician (Nazir et al., 2015, Tsifiregna et al., 2016).

The qualitative findings suggested most of the mothers used maternal initiated medication as the first line of treatment, and the mothers sought medical advice for their children only after fail their treatment or symptoms persist. Despite the age, a similar finding was reported from a study

conducted in Iran regarding on self-medication among older adults (Ahmadi et al., 2017). Further, the results suggested that mothers may select maternal initiated medication or medical advice depending the type of health problem, the familiarity of the health problem, disease severity and child's susceptibility of diseases. This particular finding can be discussed in Anderson & Newman's framework of healthcare utilization (Mortazavi et al., 2017).

Further, this study indicated very favourable perceptions of traditional and herbal medicines. Mothers perceived those are safer than pharmaceuticals with no side effects. Similar findings have also been reported in earlier studies (Loyola Filho et al., 2004, Hassan and Siam, 2014, Frazier et al., 2011, Sinusas, 2012, McIntyre et al., 2015).

The role of past experiences, perceived idea of formal healthcare services, perceived impact of illness on the child and family, external influences, understanding of benefits and risks of maternal initiated medication, perceived impact of illness on the child and family were reported as factors affecting mothers' attitudes and perceptions of maternal initiated medication. Similar findings were reported previous literature (Mainous et al., 2008, Loyola Filho et al., 2004, Robert et al., 2001, Hassan and Siam, 2014, Salami and Adesanwo, 2015, Prasadi et al., 2017, Hansen et al., 2009).

The results of the study indicate that mothers were capable of identifying adverse events of child medications. In the occurrence of an adverse event, many of the respondents discontinued the child's medication and informed their doctors about the event. Similarly, spontaneous reports to a healthcare professional about adverse events observed in previous studies, however those studies were focused on the adult population (De Silva et al., 2017, Pagan et al., 2006, Jose et al., 2015). Our study also showed experience and perception of adverse events impacted to non-adherence of the child's drug therapy including stop the therapy before intended duration and alter the dose. This malpractice may lead to disease complications or antibiotic resistance when using antibiotics (Fernandes et al., 2014). Despite the age, similar findings related to non-adherence were reported from other studies (Hassan and Siam, 2014, Choonara et al., 1996, Macdonald, 2002).

The study results showed that respondents did not use over the counter medicines with prescription-only medicines as well as pharmaceuticals and herbals together for their children. Even if participants didn't have a detailed understanding of what drug interaction is, they had a general idea that drug interactions may cause harm. Avoiding the use of OTC medicines along with medicines prescribed by physicians is a good practice since it prevents the use of two or more medicines that contain the same ingredient.

In the present study, most of mothers more concern about dose, frequency, expiry date, and storage conditions. Mothers rarely seek information about drug safety including side effects, overdoses, drug interactions and contraindications. Despite the age, the literature presented similar findings that information regarding drug safety was often deficient among people (Jose et al., 2015, Hughes et al., 2002, Modig et al., 2012).

The findings of the observational study emphasized that mothers made errors during deciding and measuring medicines for their children and there is a marked potential for providing sub-

therapeutic amounts of medication for children during maternal initiated medication. This is similar to previous studies done in other countries (LI et al., 2000, Simon and Weinkle, 1997, Frush et al., 2004).

Further, the results showed that socio-demographic factors were not affected for the accuracy of the actual measured dose of paracetamol by mothers. Similarly, Li et al, (2000) reported that there were no differences in demographics between the groups receiving correct and incorrect doses (LI et al., 2000). In contrast to this result, another study found that limited health literacy was associated with making dosing errors by parents (Yin et al., 2010).

In the current study of all 353 mothers, participants were significantly more likely to measure an acceptable dose with the syringe with compared to measuring cup ($p < 0.0001$) and calibrated spoon ($p < 0.0001$). Similarly, previous studies found that caregivers measured accurate doses with syringe more often than with measuring cup and dropper (Yin et al., 2010, Almazrou et al., 2015, Sobhani et al., 2008). Although the current study evaluated acetaminophen, this study has greater implications for other drugs available in liquid formulations for children including antibiotics and narrow therapeutic window drugs like theophylline.

Conclusions

Results suggested that in a maternal initiated medication concept for children, there is a requirement of guidance for mothers in assisting to identify the best intervention for treating child illness and proving medicine information to ensure safety and efficacy. Educating mothers about common side effects of child medication is essential to minimize medicine non-compliance and therapeutic failure. Community pharmacists can play a major role during dispensing over the counter medicines to parents by analyzing child's disease history, determining appropriate intervention and counselling the parents regarding dose regimens, proper use of measuring devices, dose calculations and commonly encountered problems of drug administration.

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