



ORIGINAL RESEARCH PAPER

Pharmacy

ASSESSMENT OF ADMINISTRATION PRACTICE OF DRY POWDER ANTIBIOTIC SUSPENSION AMONG CAREGIVERS WHO VISITS RURAL COMMUNITY PHARMACY

KEY WORDS: Dry powder antibiotic suspension, Caregivers, Community pharmacy

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ABSTRACT

OBJECTIVE: To assess administration practice of dry powder antibiotic suspension among caregivers who visit a rural community pharmacy.

METHOD: A questionnaire based cross sectional descriptive study was conducted at a rural community pharmacy from August to October 2020. A sample of 240 caregivers were asked to answer a questionnaire by interview method, wherein their socio-demographic details were also captured during this study. Data was analysed by calculating mean ± standard deviation and percentages for summarizing the data.

RESULT: Out of the 240 caregivers enrolled in the study, majority were females (73.33%), and belonged to the age group of 26-30 years (50.83%). 134 (55.83%) participants had a primary level of education and were laborers. Out of 48 (20%) participants who found the information leaflet in the medication box, 36 read the leaflet and understood the instructions. Advice regarding reconstitution of the suspension was majorly taken from physicians (50.83%) when instructions were not well understood. To prepare an antibiotic suspension, 82 (34.17%) caregivers used boiled then cooled tap water and 106 (44.16%) used distilled water provided by the manufacturer. Majority of the participants used a household teaspoon (61.67%) to measure and administer the drug. 156 caregivers (65%) said that they do not shake the reconstituted suspension before each dose.

CONCLUSION: This study showed that there is a need for improvement towards the problems associated with reconstitution, administration, storage, and handling of dry powder antibiotic suspension.

INTRODUCTION

Infectious diseases are a major public health problem which can be either viral or bacterial with an average occurrence of 6-8 times a year in children.¹ Acute respiratory tract infection (ARI) is a major condition among young children in both developed and developing countries. Prevalence of ARI according to National level surveys of India was found to be 2.4 - 8.9% for the state of Maharashtra.² When bacteria are the cause of these infections, antibiotics are considered as the drug of choice.

Antibiotics prescribed for infants and children are generally available in dry powder form, which is solid dosage form that can be reconstituted by the addition of water to administer by the oral route which avoids swallowing problem. Correct reconstitution, concentration, dose administration, duration of treatment, and storage conditions have to be considered in case of these dry powder suspensions.

These dry powder antibiotic suspensions are usually administered with calibrated measuring caps, droppers and medical spoon which are provided by the manufacturer. Household spoons are available in various sizes thus they should not be used for the delivery of medications. Use of these spoons can result in under dosing or overdosing of the drug.

Storage conditions are necessary to be maintained in case of liquid formulation as they generally tend to have much shorter shelf-lives than solid formulations.³ In order to get the optimal benefit, the reconstituted antibiotic suspensions have to be kept refrigerated. However due to reasons like no refrigerator or irregular power supply many patients fail to maintain specified storage conditions which results in degradation of the product.

Many caregivers do not administer the antibiotic suspension according to the instruction. Some caregivers fail to complete

the course of antibiotics, while some of them save unused antibiotic suspension and preserve it for future illness or pass it to other family member and friends.

In India, about 67% of people are still living in rural areas.⁴ Children residing in rural areas are more prone to acquire acute respiratory infection due to risk factors like social class, mother's education, type of house and fuel used for cooking, overcrowding, cross-ventilation, parental smoking, birth weight, and nutritional status.⁵ Also limited studies are available on the reconstitution problems associated with dry powder antibiotic suspension. Thus the purpose of our study is to assess the administration practice of dry powder antibiotic suspension among caregivers who visit rural community pharmacy.

MATERIALS AND METHODS

The study was a cross sectional questionnaire based descriptive study conducted for a period of 3 months from August to October 2020 at a one of the busy community Pharmacy situated in rural area of the Katraj, Pune. A written permission was obtained from the Head Pharmacist of Pharmacy prior to initiation of the study. Caregivers who visited the pharmacy on any random day between 10 am to 5 pm with a prescription containing dry powder antibiotic suspension formulation were included. A pilot study was conducted during which 50 caregivers were given the self-administered questionnaire and they responded to all the questions without any confusion. Complete information regarding the study was provided to 285 caregivers out of whom 240 willingly agreed to participate in the study. The sample size was calculated based on the Raosoft sample size calculator with a 5% margin of error, 95% confidence level, and 50% response distribution. The self-administered questionnaire was prepared with reference to the extensive literature review^{1,8,16} and validated by the clinical pharmacy department. The reliability scale evaluation, performed using

Cronbach's alpha showed the questionnaire to reach acceptable reliability, $\alpha = 0.743$. The questionnaire was divided into two sections. The first section comprised of demographic details of the caregivers. The second section included questions based on the approach towards patient information leaflet, method of reconstitution, administration techniques and storage conditions of dry powder antibiotic suspensions. Data were analyzed by calculating mean \pm standard deviation and percentages for summarizing the data using Microsoft Excel 2008 software.

RESULT

The response rate found in our study was 84% as out of the 285 caregivers 240 agreed to participate in this study. Majority of the caregivers belonged to the age group of 26-30 years (50.83%) and were females (73.33%). 78.33% participants in our study were from the rural area. Most of them had completed their primary level education (55.83%) and when asked about their employment status majorities were found to be laborer (76.67%). 53.33% of the caregivers had a child who belongs to the age group of 3 - 5 years [Table 1].

Out of the 240 caregivers, 80% claimed that they did not receive the information leaflet provided by the manufacturer in the medication carton. Among those who received the information leaflet, 36 (15%) took out the time to read the information leaflet and understood the instructions as well [Table 2]. Majority of the caregivers took assistance regarding instructions for reconstitution of antibiotic suspension from their doctors (50.83%) [Table 3].

Table 4 shows what type of water was used for reconstitution of dry powder antibiotic suspensions by the caregivers. Fortunately, 44.16% reported the use of distilled water provided by the manufacturer. We also found around 21.67% of caregivers who used tap water directly for reconstitution. Household teaspoon was used for administration of the drug to the patient by 61.67% of the caregivers [Table 4]. 61.67% of the caregivers stored the reconstituted suspension in the kitchen cupboard [Table 4].

Regarding the method of administration, 65.00% of the participants did not shake the reconstituted suspension prior each use. When asked regarding what they do with the leftover suspension, 56.67% claimed to discard the remaining suspension and 43.33% said they preserved it for future illnesses [Table 5].

DISCUSSION

Our study aimed at assessing the practice of reconstitution, administration, and storage of dry powder antibiotics suspension by caregivers which were intended for use in children. Antibiotics and some moisture sensitive drugs are instable when maintained in an aqueous medium for an extended period, thus these are frequently manufactured as reconstitutable dry powder suspensions and are considered as an ideal formulation for administration of the drug in infants and children.^{10,15} This cross sectional study conducted at a community pharmacy in a rural area investigated that 240 caregivers presented with a prescription containing at least one dry antibiotic suspension during 3 months. Among those who agreed to participate majority were females (73.33%). These findings imply that female caregivers play a major role in medication administration in pediatric patients. Considering the location of our study we could relate to the fact that a higher number of the caregivers had a primary level education (55.83%) in our study. Lack of appropriate knowledge among caregivers can be a major cause for improper practice being followed.

"Patient information leaflets are handouts that address issues that are specific to particular drugs and drug classes, and they contain FDA-approved information that can help patients use

the medicine safely and effectively and try to avoid serious adverse events."⁶ These labels are prepared by the manufacturer to overcome complicated reconstitution and dosing instructions to aid patient use. For the appropriate benefit of dry powder antibiotic suspensions, it is necessary to abide by these instructions. In a study conducted by Dass A. S. et al⁷ it was found that very few patient information leaflets were seen in oral suspension cartons. This justifies the finding in our study where 80.00% of the caregivers did not receive patient information leaflet along with dry powder antibiotic suspension cartons. We found that only 15.00% of the caregivers in our study read and understood the instructions. Which is in compliance with a study conducted by MVK Patil et al¹⁴ who reported 12.67% of their study subjects read the information leaflet regularly.

Individuals who do not receive the information leaflet or are unable to read and understand the information usually rely on other sources of information such as physician, pharmacist or friend and family members. In our study physicians (50.83%) were considered as the major source of information and only 20.00% asked pharmacist for assistance. As people in rural areas rely on physicians for basic medication information, due to the lack of awareness among them about the role of a pharmacist in medication education. On the contrary Rowa' J. AlRamahi et al⁸ reported 44.00% of their study participants to consider pharmacists as their source of information.

Reconstitution of dry powder antibiotic suspensions can be a tedious process if the instructions are not well understood. The process of reconstitution consists of the following steps; tap the container to loosen the powder. Add 2/3rd of the total amount of water and shake vigorously to suspend powder and avoid lumps. Finally add the remaining amount of water and shake the suspension.⁹ This water used for reconstitution should be either distilled or purified water rather than tap water to avoid the possibility of adding impurities to the final suspension.¹⁰ Majority followed the right practice of using boiled and then cooled water for reconstitution in our study, which is similar to a study conducted by Rowa' J. Al Ramahi et al⁸. Whereas, 21.67% of the caregivers were found to use tap water for reconstitution of the suspension in our study.

A study from Gujarat by Buddhadev MD et al¹¹ stated that delivery of liquid preparations is susceptible to several dosage errors associated with the dosing device. The volumes of the household teaspoons have shown to range from 2-9 ml are particularly poor measuring devices. Beckett V. L. et al¹² also stated that household teaspoons used for measuring oral medication are inaccurate. But the majority of our study subjects were found to rely on the household spoon (61.67%) for measuring and administering the suspension. This practice among caregivers can be justified considering that the majority of them reside in the rural area and are not educated regarding the appropriate dosing techniques. This can lead to under or over dosing, resulting in reduced therapeutic effect or serious harmful effect.

Reconstituted dry powder suspensions remain stable when stored in the refrigerator for the labeled period, usually 7 to 14 days.¹⁰ In rural areas due to lack of 24hr power supply and unavailability of refrigerators in most of the houses, storage conditions of reconstituted antibiotic suspensions are hampered. We found that majority of our study caregivers stored the reconstituted suspension in the kitchen cupboard (61.67%). C. N. Stanley et al¹³ stated that when antibiotics are stored in a cupboard at room temperature, there was degradation of the product by the third day of reconstitution. Implying that in the absence of adequate storage conditions, patients taking these reconstituted drugs only receive sub-optimal doses after the third day.

Chan G. C. et al¹ reported 15% of parents in his study

administered to their child leftover antibiotics that they had saved from a previous illness, which was also seen to be followed by caregivers in our study who reported that they preserved leftover suspension for further illnesses (43.33%). This practice persists among caregivers as they are not instructed to discard the remaining portion, which would be unfit for use at the later time. Correct practice of discarding the leftover reconstituted antibiotic suspension was followed by 56.67% of the caregivers in our study.

CONCLUSION

This study highlights that patient information leaflets were unavailable in the majority of the antibiotic suspension cartons. This was the major cause of improper techniques being followed among the caregivers. Even though the correct practice of reconstitution was followed by most of the caregivers, incorrect technique of administration of suspension using household spoon was seen. Lack of knowledge among caregivers regarding pharmacist as a medication counseling provider was still found to be prevalent in the rural area. Thus there is a need for improvement towards the problems associated with reconstitution, administration, storage of dry powder antibiotic suspension.

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Table 1: Socio-demographic details of study subjects:

Characteristic	Number of caregivers n = 240	Percentage (%)
Age (years)		
26-30yr	122	50.83
31-35yr	75	31.25
36-40yr	28	11.67
41-45yr	15	6.25
Gender		
Male	64	26.67
Female	176	73.33
Education status		
Primary level	134	55.83
Higher level	82	34.17
Graduate level	24	10
Living Status		
Urban	52	21.67
Rural	188	78.33
Employment Status		
Labour worker	184	76.67
Housewife	56	23.33
Child age		
0 to 2yr	112	46.67
3 to 5yr	128	53.33

Table 2: Availability of patient information leaflet in medication carton

Characteristics	Number of caregivers n = 240	Percentage (%)
Did not receive the patient information leaflet	48	20
Received patient information leaflet	192	80

Table 3: Source of Information about dry powder antibiotic suspension

Source of Information	Number of caregivers n = 240	Percentage (%)
Doctor	122	50.83
Pharmacist	48	20
Family/Friends	70	29.17

Table 4: Caregivers practice regarding reconstitution, administration and storage of dry powder antibiotic suspensions:

Characteristics	Number of caregivers n = 240	Percentage (%)
Method for reconstitution		
Distilled water provided by manufacturer	106	44.16
Boiled and then cooled tap water	82	34.17
Normal tap water directly	52	21.67
Tools used for administration		
Household teaspoon	148	61.67
Cap provided by Mfg.	92	38.33
Storage condition		
Dining room	76	31.67
Kitchen Cupboard	148	61.67
Above refrigerator	16	6.66

Table 5: Caregivers practice towards leftover reconstituted suspension

Characteristics	Number of caregivers n = 240	Percentage (%)
Discard it	136	56.67
Use for next period of illness	104	43.33

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