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Availability of Pediatric Medicines and their Perception among Prescribers at a Tertiary Care Teaching Hospital

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ABSTRACT

The pediatric population is heterogeneous group with markedly different pharmacokinetics from that in adults. However, conventionally adult dosage forms are fragmented to treat pediatric patients due to the poor availability of *child friendly* formulations in public health facilities. An observational, cross-sectional study was undertaken at pharmacy store and pediatric department at a tertiary care hospital. Each medicine with dosage form and strength was listed separately and compared with WHO Model List of Essential Medicines for Children (EMLc), Key tracer and Priority medicines for children. Prescribers were also interviewed using a validated structured questionnaire. Out of 27 drug groups listed in WHO EMLc, a large deficiency was observed in chemotherapeutics (47%), gastrointestinal (50%) and ophthalmic preparations (100%). Out of total 258 paediatric medicines, 55.8% were available. A gross deficiency of child specific dosage formulations was also observed. Majority (91%) of the prescriber confessed of using fragmented adult formulations and experienced drug administration problem. The availability of paediatric medicines in appropriate dosage formulations and strength is not satisfactory at public health facilities. Pharmacologically, children are separate group and their need should be addressed by including *child friendly formulations* in EML or having separate EMLc.

Keywords: Essential medicine, paediatric, Child friendly formulations.

INTRODUCTION

Every year worldwide 7.6 million children die under five years of age (Children: reducing mortality, WHO media centre, 2010). Surprisingly; two-thirds of these deaths are due to common conditions that could be prevented or treated with access to simple, effective and affordable medicines. However, the availability of medicines at public health facilities is often poor. Hence, WHO launched campaign '*Better Medicines for Children*' and '*Make Medicines Child Size*' to raise awareness and address the need to improve availability of safe and child-specific medicines for all children. A Model List of Essential Medicines for Children (EMLc) was also developed by WHO (WHO-EMLc, 2010). Subsequently; Indian Academy of Paediatrics also prepared EMLc in July 2011 based on the WHO criteria for selection of essential medicines and the National Health Programmes (*Indian Academy of Paediatrics, 2011*).

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While in India, children form a sizeable population seeking medical services from public health facilities, the concept of having paediatric medicines or '*child friendly formulations*' is very recent. Although the procurement of core medicines in public sector hospital is based on Essential Medicine List of the State, there is no separate list for paediatric medicines and conventionally, adult dosage forms are fragmented to treat children. Thus, the present study was undertaken to find out the availability of essential paediatric medicines and their perception among the prescribers in a tertiary care hospital.

MATERIALS AND METHODS

It was an observational, cross sectional study carried out at pharmacy store and paediatric department of Civil Hospital, Ahmedabad (CHA), a tertiary care teaching hospital. A survey form was prepared to collect the information regarding availability of paediatric medicines, their dosage forms, and strengths. Availability of medicines was physically verified by data collector at pharmacy store and in paediatric and related wards (for example emergency department, operation theatre etc.). Each medicine with dosage form and strength was listed separately and compared with Model List of Essential Medicines for Children (EMLc), March 2010, Key tracer pediatric medicines, the minimum basic requirement for children and Priority Medicines for Children, based on the morbidity patterns defined by WHO (Better medicines for children project, 2009).

A pre-validated structured questionnaire regarding practices and awareness of pediatric medicines was used to interview the prescribers at the hospital. The data was entered in Microsoft Excel sheet and analyzed.

RESULTS

Drug groups

Out of total 27 drug groups listed in WHO EMLc, a large deficiency in chemotherapeutic (47%), dermatological (65%), gastrointestinal (50%) and ophthalmic preparations (100%) was observed.

Paediatric Medicines

Out of total 258 medicines, 405 dosage formulations and 569 strengths listed in WHO EMLc, 144 (55.8%), 169 (41.7%) and 188 (33%) respectively were available at Civil Hospital Ahmedabad (CHA) (Fig.-1). The essential medicines found to be deficient were primaquine (15mg), sulfadoxine+pyrimethamine (500+25mg), azithromycin suspension, hydroxycobalamin suspension, caffeine citrate suspension, artesunate, quinine and digoxin (injection).

While out of 23 key tracer medicines, 28 dosage forms and 29 strengths, only 17, 9 and 7 respectively were available (Fig.1). Amoxicillin (suspension-125mg/5ml and tablet-250mg), cotrimoxazole tablet (480 mg), oral rehydration solution powder, paracetamol suspension (125mg/5ml), vitamin A capsule (100000IU) were available while co-amoxiclav, artemether +

lumefantrine, beclomethasone, benzyl penicillin injection, carbamazepine suspension, diazepam rectal solution, ferrous salt suspension, gentamicin injection, ibuprofen tablet (200mg), isoniazid scored tablet, phenobarbitol, phenytoin, procaine penicillin, salbutamol inhaler and zinc were deficient. In addition, out of 10 priority medicines for children, only five were available at CHA (Table-1).

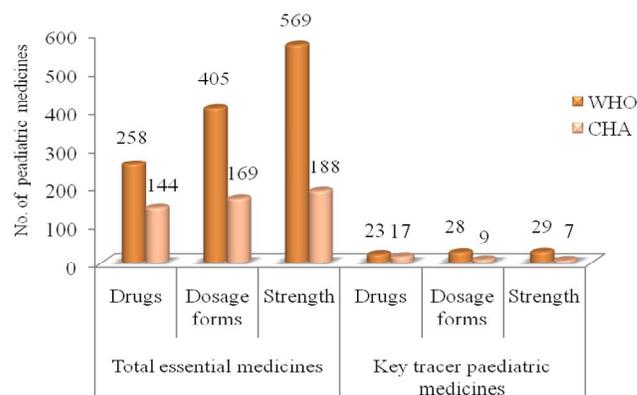


Fig. 1: Comparison of availability of paediatric medicines in tertiary care hospital. WHO- World Health Organization, CHA- Civil Hospital Ahmedabad.

Table. 1: Availability of Priority Paediatric Medicines in tertiary care hospital.

Medicines	Availability
Oral rehydration solution	Yes
Zinc	No
Amoxicillin	Yes
Ampicillin injection	Yes
Gentamicin injection	Yes
Ceftriaxone	No
Artemether-lumefantrine	No
Quinine/Artesunate injection	No
Morphine	No
Vitamin A	Yes

Paediatric Formulations

A gross deficiency of child specific dosage formulations especially oral liquid, scored and kid tablets was observed when compared to WHO EMLc (Fig.2).

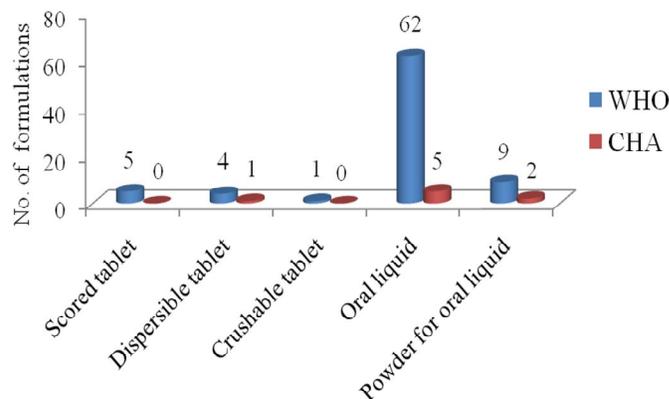


Fig. 2: Availability of child specific formulations in tertiary care hospital. WHO- World Health Organization, CHA- Civil Hospital Ahmedabad.

Practices among Prescribers

A total of 47 paediatricians including teaching faculties and residents were interviewed. Majority (91%) of them confessed

of using fragmented adult formulations for children, 43% observed poor clinical response and 85% experienced drug administration problem. Moreover, 91% of the prescribers emphasized the need of paediatric dosage forms for azithromycin, co-amoxiclav, zinc sulphate and phenobarbitone. However, only 40% of prescribers suggested of having separate Essential Medicine List for children (EMLc).

DISCUSSION

Children are often considered as young adults. However, pharmacologically they form a heterogeneous group with markedly different pharmacokinetics from that in adults. Children, particularly infants and newborns suffer from different disease than adults and thus require tailor made specific medicines in correct dose and appropriate dosage formulations.

Our study showed a modest deficiency of paediatric medicines and total scarcity of paediatric dosage formulations at a tertiary care hospital, situated in western part of India with 2000 beds that caters to patients from the states of Gujarat, parts of Rajasthan, Madhya Pradesh and Maharashtra. The poor availability pattern of paediatric medicines in public health facilities has been similar in other states of India, and resource limited countries (Gitanjali and Manikandan, 2011; Robertson *et al.*, 2009, Rangnathan *et al.*, 2008).

The minimum requirements of key tracer and priority medicines for children were also deficient. The objective of having priority medicines for children (proposed by WHO) is to select and make them available to reduce newborn and child morbidity and mortality. While the non availability of these medicines particularly oral zinc and artemether-lumefantrine/artesunate injection is a matter of concern. These medicines have been included in the EML and recommended in standard treatment guidelines for the management of diarrhoea and malaria in children, the lack of availability in public health sector raises several questions on the actual management of these conditions.

Secondly, a gross deficiency of paediatric strength and dosage formulations especially oral liquid, scored and kid tablets was found. Scarcity of appropriate dosage formulations for phenobarbitol, phenytoin, carbamezipine, and diazepam (rectal solution) was alarming. This indicates that adult dosage formulations were manipulated at ward by nursing staff or parents at home to meet the need for small doses in paediatric patients. Such manipulations may involve cutting or grinding up tablets or dispersing or mixing drugs with food or drinks before administration. These practices may result into medication error either under dosing or overdosing as the bioavailability of the drugs following such manipulations is often unknown and unpredictable.

In order to get the realistic picture of actual practice, prescribers were interviewed. The paediatricians' daily practices clearly reflected of using fragmented adult medicines for paediatric patients and experienced drug administration problem. However, their awareness regarding having a separate EML for children was low. The study methodology used was of short duration, one time

and suitably modified to an established method of collecting some background information. However, it should be noted that the quality of data collected was high as the data collector personally verified the availability of medicines in pharmacy store and wards. Moreover, information collected includes all paediatric medicines listed in WHO EMLc, key tracer and priority medicine for children. It has been argued that child friendly formulations are more expensive than adult dosage forms, requires more space to store and special facility to maintain the stability in extreme of temperature. Due to high cost, the demand is limited which therefore leads to restricted market. In addition, they are likely to be misused in public hospitals. Thus paediatric formulations are either not indent or not quoted by vendors in public health facilities due to limited market. Further, it has been observed that even if paediatric formulations are incorporated in EML, wide gap has been noted between EML and the procured medicines. Under the *Better Medicines for Children* (BMC) initiative of the WHO, the two states in India namely Chhattisgarh and Orissa revised EML and incorporated substantial number of paediatric formulations. Despite this only 7% - 17% paediatric medicines were procured (Gitanjali B, 2011). These observations call for engaging the health care policy makers, decision makers, health care professionals and prescribers to undertake the task seriously to improve the access of paediatric medicines that will have a significant impact on child morbidity and mortality. Thus, it can be concluded that availability of paediatric medicines in appropriate dosage formulations and strength is not satisfactory at public health facilities. Pharmacologically, children are separate group and their need should be addressed by including *child friendly formulations* in EML or having separate EMLc.

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