

Hygiene For Preparation Of Infant Formular In A Developing Country

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Abstract: The study determined the efficacy of protocols employed in replacement/artificial feeding using commercial infant formula. The study was carried out in the different suburban locations of Harare, Zimbabwe. A sample size of 20 mothers/caregivers giving commercial infant formula to their babies at between 0-6 months was targeted. Convenience and snowball sampling techniques were used to identify the participants. Interviews using a structured questionnaire were conducted and complemented by direct observation of the participants as they prepared the infant formula. The results were tallied against a checklist of recommended practices and label instructions. The results established that there were short falls in the preparation procedures as employed by the caregivers, mainly the mixing order of powder and water, temperature of the water for reconstitution and handling of left over formula after feed; 50 percent of caregivers were not adhering to the label instructions as given by the manufacturers and to recommendations proposed by World Health Organisation. Poor hand washing was indicative in 80% of the cases. Bottle feeding was predominant (n=16) compared to cup feeding (n=4) and the population practicing artificial feeding were mostly the young (90%), married (80%), educated (100%) and working group (90%). The researcher recommends that health providers strengthen efforts to ensure that adequate information/counselling and consistent advice of optimal benefit to the infant-mother pair be given and that the Ministry of Health and Child Welfare Nutrition unit must strictly monitor the activities and the information given out by infant formula manufacturers as stipulated by the International Code of Marketing of Breast milk Substitutes and also giving them the responsibility of following up on the appropriate use of their products.

Index Terms: commercial infant formula, caregivers, contamination, hygiene, infants, milk, risk.

1 INTRODUCTION

According to the global strategy for infant and young child feeding of 2002, as a global public health recommendation, infants should be exclusively breastfed for the first six months of life to achieve optimal growth and development [1], [2]. However; some special or difficult circumstances may call for replacement feeding [3]. Some mothers are unable to breastfeed, and others choose not to breastfeed, or choose to combine breastfeeding with use of infant formula [4]. Use of infant formula has been cited for numerous increased health risks [5], [6]. It was noted that infants who consumed formula were at increased risk for acute otitis media, gastroenteritis, severe lower respiratory tract infections, atopic dermatitis, asthma, obesity, type 1 and 2 diabetes, sudden infant death syndrome (SIDS), eczema, necrotizing enterocolitis, autism, lowered I.Q and neuro developmental delays when compared to infants who were breastfed [7], [8], [9], [10], [11], [12]. Infant formula was developed in the 1920s to provide a medically acceptable alternative to breast milk for mothers who were not able to breastfeed their babies [13], [1]. Infant formula is a manufactured food designed and marketed for feeding to babies and infants under 12 months of age, usually prepared for bottle-feeding or cup-feeding from powder (mixed with water) or liquid (with or without additional water) [14]. The U.S. Federal Food, Drug, and Cosmetic Act (FFDCA) defines infant formula as "a food which purports to be or is represented for special dietary use solely as a food for infants by reason of its simulation of human milk or its suitability as a complete or partial substitute for human milk". Powdered infant formula (PIF) is not a sterile product and may be intrinsically contaminated with pathogens that can cause serious illness in infants [3]. Powdered infant formula has been associated with serious illness and death in infants due to infections with *Enterobacter Sakazakii* [8]. During production, PIF can become contaminated with harmful bacteria, such as *Enterobacter Sakazakii* and *Salmonella Enterica* [4], [15]. Studies on the importance of hygiene for preparation and storage infant formula were reported by Redmond and Griffith, [16]. They found that consumer hygiene habits were inadequate and relate both to microbial growth, survival and cross-contamination. Iversen [17], Setchell [18] and Agostoni

[19] reported the emergence of microorganisms in infant formula due to poor preparation hygiene. This study focuses on evaluating the household hygienic conditions under which infant formulas are prepared and administered in Harare, Zimbabwe. In underdeveloped countries, it is claimed that hygiene is lacking, sterilization procedures are not employed, and mothers lack the education to read written instructions [10]. This study has never been carried out in Zimbabwe and it aims at finding ways to eliminate disease outbreaks in infants feeding on commercial milk formulas.

2 METHOD

Qualitative research was used. Interviews using a semi structured questionnaire and overt observation techniques were employed. A checklist was used to evaluate the infant formula usage patterns against the recommendations and to determine gaps in usage. Non probability sampling methods namely the snowball and convenience methods were used to identify participants as statistics on mothers/caregivers using replacement/artificial feeding were unknown. A sample size of 20 was used and the inclusion criteria centered on purchase/inquiry of the starter infant formula (pharmacy context), consent to participate and caregivers of infants fed on formula from 0-6 months of age (with or without complementary food). The tools focused on getting data on socio-economic demography, infant information, preparation and feeding practices, hygiene and handling. A pilot testing of the questionnaire was done to test suitability of the tool and adjustments made accordingly.

3 RESULTS

3.1 Socio-demography

Table 1 shows the socio-demographic characteristics of the participating mothers (n=20). The majority (75%) of the mothers/caregivers giving commercial formula to their infants were between the ages of 20-30 years. The lowest education status reached was secondary school with 90% having gone through tertiary education. 90% of the mothers were employed as either full time, part time or self while only 10% were

unemployed. 80 percent of the mothers/caregivers were married and 20 percent were single. Fifty percent of mothers were having infants for the first time while the other half had children previously.

TABLE 1
SOCIO-DEMOGRAPHIC CHARACTERISTICS OF MOTHERS

Variable		%
Age: years	20-25	65
	26-30	25
	31-35	10
	36-40	0
Highest education obtained	Primary	0
	Secondary	10
	Tertiary	90
Marital status	Married	80
	Single	20
Employment status	Full time	40
	Part-time	20
	Self employed	30
	Unemployed	10
Number of children	One	50
	Two	45
	Three	5
	Four and more	0

3.2 Infant formula preparation procedures

Table 2 shows the percentage distributions of mothers who follow recommended steps for making infant formula.

3.2.1 Handling and Hygiene during preparation of infant formula (step 1 and 2)

All participants washed hands with soap and water, and dried using a clean cloth or a single-use napkin. 55% of the participants wiped the preparation surface with a wet or dry cloth before starting the formula preparation process. Hand washing using the correct procedure is very crucial at every stage considering that at this stage there is a lot of dirty nappy handling and the chances of cross contamination are very high, thus increasing the vulnerability of the infant to infection.

3.2.2 Temperature of water for reconstitution (Steps 3 and 4)

85% of the participants followed step three correctly. Of the 3 participants who failed to follow the boiling procedure, two were using the electric kettle and did not wait for it to turn off by itself instead they removed it when it started to boil. The other one who was using a stove removed the water when it started to show bubbles instead of the rolling boil. As for step four, 55% of the mothers performed the procedure correctly while the remaining 45% used the water while boiling thus did not wait for it to cool.

3.2.3 Equipment used and measurements of formula (step 5)

The majority of the caregivers (80%) used bottles with teats for feeding as opposed to cups (20%), citing the reasons that it was easier to feed with a bottle than a cup and that cup feeding was tedious and messy. Cup feeding is recommended for hygienic reasons, it is easy to clean and impossible to keep left over formula for a prolonged duration unlike bottles which are difficult to clean on the crevices and encourage the keeping of left over formula for a greater duration, thus spoilage. Instructions on commercial infant formulas (Nan 1, Lactogen 1 and S26) state that water must be measured first followed by addition of an exact amount of powder before mixing. In this study, 50% of participants added powder to water and the other half added water to powder. Five percent of the mothers (n=1) used an electric balance to measure the powder and 10% of the mothers (n=2) used a rounded scoop measure instead of the level. Water measurements were done using the measuring jug (n=9), the feeding bottle (n=10) and a tea cup (n=1).

3.2.4 Use and storage of infant formula (steps 6-9)

In the study, 80% of the mothers managed to follow the procedure of quickly cooling the formula after the addition of the hot water by placing in a dish full of cold water while 20% left the bottle to cool at room temperature. All participants dried the cup and bottle on the outside with a dish towel. 75% (signifying the total participants giving formula while warm) tested the temperature using palms while 25% did not test the temperature as they administered the formula at room temperature.

TABLE 2
RECOMMENDED STEPS FOR MAKING INFANT FORMULA

Step		(%)	
		Yes	No
1	Clean and disinfect a surface on which to prepare the feed.	55	45
2	Wash hands with soap and water, and dry using a clean cloth or a single-use napkin.	100	0
3	Boil a sufficient volume of safe water. If using an automatic kettle, wait until the kettle switches off; otherwise make sure that the water comes to a rolling boil.	85	15
4	Pour the appropriate amount of boiled water that has been allowed to cool to no less than 70 °C, into a cleaned and sterilized feeding cup or bottle.(water should be left for no more than 30 minutes after boiling)	55	45
5	To the water, add the exact amount of formula as instructed on the label.	50	50
a	If using bottles; Shake or swirl gently until the contents are mixed thoroughly,	80	20
b	If using feeding cups: mix thoroughly by stirring with a cleaned and sterilized spoon	20	80
6	Immediately after preparation, quickly cool feeds to feeding temperature by holding the bottle or feeding cup under running tap water, or by placing in a container of cold or iced water. Ensure that the level of the cooling water is below the top of the feeding cup or the lid of the bottle.	80	20
7	Dry the outside of the feeding cup or bottle with a clean or disposable cloth.	100	0
8	To ensure the formula has cooled appropriately, let a few drops fall out on your forearm. The baby formula should feel warm on your arm, but not hot	95	5
9	Discard any feed that has not been consumed within two hours.	50	50

3.3 Water and sanitation

3.3.1 Cleaning and sterilizing feeding and preparation equipment

30% washed their hands before cleaning equipment and 70% did not wash their hands as they did not see the rationale behind the procedure, the assumption was that their hands would be cleaned in the process of washing and sterilization of the equipment thus it was perceived as an unnecessary step. In the sterilization step, 25% of the mothers (n=5) used chemical sterilizers, 25% immersed the equipment in boiling water for a few minutes and another 25% boiled the equipment in a large pan full of water and the remainder just followed the normal washing procedure using dish washing liquid. 90% of the mothers removed and dried the utensils soon after the sterilization process to put away in the cabinet instead of keeping them in the sterilization equipment until required for the next feed. 35% remembered to wash their hands before removing the equipment from the cabinet in preparation of the next feed and the rest did not wash their hands then.

3.3.2 Water sources and safety measures

Caregivers were asked to rank the availability of water and sanitation within their households, 20% ranked it as poor, 50% as average and 30% as good. The availability of adequate water and sanitation is one of the prerequisites in meeting the Affordable, Feasible, Acceptable, Safe and Sustainable (AFASS) criteria as a condition for initiating successful replacement feeding using commercial infant formula. 80% of the participants used boiling as a safety measure, 10% used aqua tabs/water gaurd and the remainder did not perform any measure to ensure water safety.

3.4 Feeding practices

3.4.1 Adequacy and frequency of feeds

40% of the infants (0-6 months) were given both breast milk and commercial formula; the other 40% were on breast milk and commercial infant formula as well as complementary foods with the remainder (20%) on exclusive commercial formula. As such adequacy could only be determined for the percentage on exclusive replacement feeding as the amount of breast milk and complementary foods given was out of the scope of this study. Twenty five percent of infants (n=1) on exclusive replacement feeding received the adequate amount of formula per day, 50% (n=2) received an inadequate amount of formula and the remaining 25% were getting an excess amount of formula per day.

3.4.1 Active/responsive feeding

In the study the mother of the infant, the nun and close relatives (sisters and aunts) fed the infants. The mothers only fed their babies when they were at home and the nuns took up the responsibility in the absence of the mother. It was established that adequacy of each feed was deduced by refusal to continue feeding, spitting or vomiting.

4 CONCLUSION

The study found that there were short falls in the preparation procedures as employed by the caregivers and mothers. The main lacking area was the mixing order of powder and water, maintaining correct temperature of the water for reconstitution and handling of left over formula after feed procedures. This showed that caregivers were not adhering to the instructions as given by the manufacturers. This compromises the safety and nutritional adequacy of a formula feed making the infant more susceptible to diarrheal diseases and malnutrition. There are some identifiable gaps between the protocols being employed by caregivers/mothers in the preparation of formula and those recommended by both the manufacturer and WHO which pose a risk to the health and development of infants on replacement/artificial feeding using commercial infant formula. There is a great need for health providers to improve and strengthen efforts that promote and protect breastfeeding.

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