Formula feed preparation: helping reduce the risks; a systematic review

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Aims: To assess what is known about the risks associated with errors in reconstituting the present generation of infant formula feeds, and to examine which methods are likely to be safest.

Methods: Systematic review, and examination of the range of infant formula products currently on sale in the UK. Studies from developed countries conducted after 1977 were included. All studies investigating the reconstitution of formula feeds for full term, healthy babies were eligible. Parameters studied were: measures of accuracy of feed reconstitution including fat, protein, total solids, energy content, and osmolality of feed; weight of powder in scoop; and reported method of preparing feed and measuring powder. Formula products were collected from one large UK supermarket in 2002. Number of different types of infant formula preparations available for sale were determined, together with scoop sizes for powder preparations.

Results: Only five studies were identified, none of adequate quality or size. All found errors in reconstitution, with a tendency to over-concentrate feeds; under-concentration also occurred. Thirty one different formula preparations were available for sale in one UK supermarket, with a range of scoop sizes. Some preparations had never been tested.

Conclusions: There is a paucity of evidence available to inform the proper use of breast milk substitutes, and a large array of different preparations for sale. Given the impact incorrect reconstitution of formula feeds can have on the health of large numbers of babies, there is an important and urgent need to examine ways of minimising the risks of feed preparation.

METHODS

A systematic review was carried out in which relevant studies were identified, analysed, and summarised. To establish the context for the review, we also examined the range of products on sale in one large UK supermarket.

Systematic review

Inclusion criteria

Studies carried out in developed countries for which data were collected after 1977 were included. All studies investigating the reconstitution of formula feeds for full term, healthy babies were eligible for inclusion, regardless of study design. No quality criteria were introduced as so few studies were identified. Non-English citations were included, but studies carried out in developing countries were excluded, as the issues are different in such dissimilar settings.
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DISCUSSION

The most striking finding from this review is the paucity of information on a topic important to the health of large numbers of babies worldwide. In the UK alone, 31% of babies are fed breast milk substitutes from birth, and this number increases to around 79% by the time babies are 6 weeks old.12 Hundreds of thousands of babies each year in the UK, and many more worldwide, are completely dependent on the proper use of these products, yet we found no previous reviews on the reconstitution of feeds and only five relevant studies. All found that errors were made when reconstituting feeds, although none considered the wide range of products currently available.

The World Health Organisation Code on the marketing of breast milk substitutes, adopted in 1981,13 aims to “contribute to the provision of safe and adequate nutrition for infants, by the protection and promotion of breast feeding”, and by “the proper use of breast milk substitutes, when these are necessary ...” (Article 1). However, since then, little attention has been paid to the second part of the Code’s aim, either in practice or in research. In the UK in 2000, for example, of first time mothers attending antenatal classes and who intended to fully formula feed, only 9% were taught how to make up a bottle,14 and the National Audit Office report on the maternity services in 1997 did not consider artificial feeding at all in its examination of antenatal or postnatal care.15

Many of the new infant formulae are intended to reduce error although, paradoxically, they could have the opposite effect—for example, if a parent wishes to prepare a six ounce feed using premeasured four ounce individual sachets, one sachet might be used, plus an estimated half of another, potentially yielding more error than with traditional powder and scoop. The ways in which such sachets are actually used do not appear to have been investigated. Additionally, ready-to-feed preparations are expensive, and could result in a baby being given less feed than needed, or the feed being diluted with water or other liquids such as tea—a suggestion that the latter occurred was found in the study of low income mothers by McJunkin and colleagues.16 Without studies designed to examine such issues, it is impossible to advise either parents or health professionals on the relative merits of individual products. The potential for harm resulting from over- or under-concentration of feeds is serious and includes both obesity and failure to thrive, as well as hypernatraemic dehydration.17

Furthermore, babies most likely to be artificially fed in westernised populations are those who come from lower socioeconomic groups18; these babies already suffer increased morbidity19 and their parents are those least likely to be able to afford the expensive ready-to-feed preparations. The price variation between products is considerable, with ready-to-feed preparations two or three times more expensive than powder and scoop (table 4). There is no unbiased source of information to help either parents or their advisers choose between brands, and between different ways of reconstituting...
feeds. Health professionals, like parents, have to rely on information produced by product manufacturers.

This review did not include issues related to the safety of breast milk substitutes in developing countries. Although many issues are similar, in developing countries there are additional risk factors to consider—for example, transport and availability of products, lack of clean water, the cost of artificial substitutes, and a lack of appropriate feeding equipment, manufactured to required standards. These are fundamentally important issues, especially in the light of the potential for HIV transmission through breast feeding, and the numbers of babies who need to be artificially fed as a result of their mother’s illness or death. In the search for papers for this review, we identified only one paper related to feed reconstitution in a developing country context, indicating that the lack of evidence base is just as profound as in the western world. A full and proper assessment of the various risks associated with the use of breast milk substitutes is needed to inform this debate.

Further research

It is important to continue looking at ways to support women in initiating and maintaining breast feeding, enabling mothers to breast feed their babies for as long as they wish. In addition, however, it is important to minimise the risks associated with breast milk substitutes. Specifically, parents need to know which ways of giving their babies formula feeds are the simplest, most accurate, and cost effective. It is important to identify the outcomes as well as the sources of error in making up feeds—what contribution do they make to infant mortality and morbidity?

Recommendations

The range of ways in which manufacturers package and sell breast milk substitutes needs to be examined; they themselves recognise that risks are introduced in the reconstitution of their products. Some consistency in approach would be a step forward, perhaps moving towards uniform instructions and scoop sizes for the reconstitution of all products and brands. This would avoid confusion for parents when changing from one product to another, and help health professionals teach parents how to make up feeds more accurately.

A source of unbiased information is needed to inform parents and health professionals about the differences between the available formulae, including the different forms in which they are sold. In the UK there is an important role in this regard for both the Food Standards Agency and the Department of Health.

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REFERENCES
