International Journal of Innovative Research in Medical Science (IJIRMS)
Volume 07, Issue 02, February 2022,
https://doi.org/10.23958/ijirms/vol07-i02/1350

Original article

Weaning Practices Impact Factors and Outcomes: Cross-Sectional Study

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Received 10 January 2022; Accepted 29 January 2021; Published 01 February 2022

Abstract

Objective: Numerous policies and initiatives have been set up in hospitals and health centers supported by the Ministry of Health (MOH) in Oman, to comply with international guidelines on breastfeeding and supplementary breastfeeding of infants and children. Highlight maternal practices in breastfeeding and weaning will exemplify the gap between maternal knowledge and real practice. The objective of the study was to explore the practices related to weaning and its relation to child weight and hemoglobin level. ***Methods:*** The study used a cross-sectional design between September 2018 and February 2019. Pretested form used to collect data from mothers of 9 to 13-month-old children attending an immunization clinic. Collected data included; demographic data, breastfeeding history, and complementary feeding practices. Anthropometric measurement and blood sampling for hemoglobin (Hb) levels. ***Results:*** A total of 181 children was enrolled. Exclusive breastfeeding for six months was reported in 9.9% (n=18) of the sample. The majority of mothers started with starch/cereal 48.1% (n=87) as their first supplementary diet. However, we found that 28.2% (n=51) began using commercial foods. Moreover, 21.7% (n=39) provided commercial food as a main daily snack. The daily food group was composed of 58% cereal (n=105). Blood was collected on 87.8% (n=159) of the children for a Hb concentration test. The mean Hb level found was 10.8 (SD: 0.99). Protein consumption was not significantly related to the Hb level (p = 0.26). However, it was related to the nutritional status of the child (p=0.013), with all children whose waste did not consume a protein source most of the time. ***Conclusions:*** While the MOH efforts are well documented, there are still areas where community enforcement is inadequate. Findings: The employment of mothers had a significant influence on the duration of exclusive breastfeeding, and the nutritional status of infants and infants was highly dependent on protein intake in the diet. Efforts should be made to identify knowledge gaps, and barriers faced by mothers.

Keywords: ***Weaning practices; Exclusive breastfeeding; Complementary feeding; Oman; Minimum Meal Frequency; Minimum Dietary Diversity***

Introduction

Weaning is known as a progressive transition period in infant nutrition, from the exclusive dependence on breast milk to the introduction of solid foods. The World Health Organization (WHO) encourages healthy mothers to exclusively breastfeed (EBF) their full-term and healthy infants within the first six months of giving birth [1]. Any deviation from normal withdrawal practices may result in significant health complications for infants [2].

Bottle feeding is preferable to breast milk in underdeveloped countries, which have drawbacks such as gastritis, dental caries, diarrhea and certain allergic disorders [3]. Various factors can influence the practice of weaning, such as mothers' educational attainment, work status, family socio-economic status, culture and beliefs. Early weaning was observed as a trend in Gulf Cooperated Council (GCC) member states [4], especially among employed mothers [2,5].

The Minimum Food Diversity (MDD) score and the Minimum Meal Frequency (MMF) measures are key indicators adopted by the WHO to determine the quality and quantity of food consumed [6]. It may also provide an overview of a person's nutritional condition. It is therefore important to expose infants to a variety of foods, as recommended in the WHO guidelines, at the appropriate age [7].

Many policies and initiatives have been implemented in hospitals supported by the Ministry of Health (MOH) in Oman, to comply with international directives on breastfeeding and supplementary breastfeeding of infants and children. The MOH has worked tirelessly to implement these policies and has implemented nursing-friendly hospital initiatives since the early 1990s.

However, implementing these policies was not an easy task. Despite numerous attempts and plans, exclusive rates of breastfeeding in child nutrition indicators are steadily declining, and many mothers have not followed the basic recommendations of breastfeeding and complementary breastfeeding.

Highlighting breastfeeding and withdrawal practices will be an example of the gap between a mother's knowledge and actual practice [5]. Few publications exist on weaning knowledge and practices in Oman. The objective of the study was to determine the knowledge and practices related to weaning age, types of weaning foods, factors influencing the decision-making of the mother and the source of information about weaning practices.

Methods

Study setting

The governorate of Muscat is unique because it has a mixed population from all the governorates of Oman (province). There are six Willayats (Districts) in the Muscat Governorate, with 28 Primary Health Care Centres (PHCs). The study was conducted in four primary health care facilities within the governorate. Stratified sampling techniques employed, four Willayats randomly selected from the six Willayat. Then one PHC is randomly selected from each Willayat.

Study design

The study was based on a six-month cross-sectional design from September 2018 to February 2019. Calculated sample size was 173 cases based on CI 95%, power of 80 and the prevalence of exposed with the outcome (underweight, anemia at 1 year age from 2016 data) as 0.2.

Data Collection

The data were collected by interviewing the mothers using a pre-tested form by the nurse at the immunization clinic at selected PHC.

Case selection

Inclusion criteria: A term Omani child of Omani mothers visiting the vaccination, health centre was invited to take part in the study if the child was 9 months or older. Children suffering from birth defects or known chronic diseases were excluded. Children over 18 months of age were excluded (the last vaccination planned under the national programme is 18 months)

Variables of the instrument

The data collection instrument included the demographic characteristics of the child and the mother, (Age, sex, nationality, current feeding and influencing factors for initiating and selecting complementary foods). History of breastfeeding in terms of initiation, continuance and exclusivity. The data collected on complementary nutrition involved the age of initiation and the type of food. Detailed information on the diet at the time of data collection, including the daily frequency of meals, food groups, food texture and who feeds the child. Addition of salt and sugar to the diet of children and use of supplements, including vitamins and herbal herbs.

Anthropometric measurements taken in terms of weight and height to determine the health status and blood collected for hemoglobin as part of routine care in the Extended Immunization Program.

This study adapted the categorization of haemoglobin (Hb) and the standard operating procedure of the MOH for the management of malnutrition in infants and young children in primary health care services [8]. The birth weight > 2.5 kg is normal and the weight corresponds to the length/height. The growth charts for the Child Health Card are used to determine the nutritional status as follows: Above +3SD = Obese, between +2SD & +3SD = overweight, between -2SD & +2SD = normal, between -2SD and -3SD = moderate wasting and below -3SD = severe wasting.

While the haemoglobin level is considered normal if 11 g/dl and abnormal if <11 g/dl.

Birth weight and gestational age at birth data collected from a national Child's Health Card.

The WHO assessed the nutritional appropriateness of infants and children using two indicators to assess infant and young child feeding practices [9]. The indicators selected for this study focused on supplemental feeding practice. These indicators include: minimum dietary diversity, minimum acceptable diet and minimum meal frequency. The selected indicators are defined as follows:

Minimum dietary diversity (MDD) at 6–23 month indicator defined as a percentage of children 6–23 months of age who consumed foods and beverages from at least five out of eight defined food groups during the previous day. Minimum dietary frequency (MDF) at 6–23 month indicator defined as a percentage of children 6-23 month of age who consumed solid, semi-solid or soft foods (but also including milk feeds for non-breastfed children) at least the minimum number of times during the previous day. Minimum acceptable diet (MAD) at 6–23 month indicator defined as a percentage of children 6-23 months of age who consumed a minimum acceptable diet during the previous day.

Pilot phase

The data collection instrument was reviewed by three healthcare experts to determine the validity of the content and was piloted with 10 mothers.

Statistical Methods

All data were converted into spreadsheets and analyzed using the Social Sciences Statistical Software Package (SPSS) version 20 (IBM Corp. Chicago, Illinois, USA). A descriptive analysis of frequencies, percentages, averages and standard deviations was performed. Appropriate tables and graphics have been developed to describe the study population. Statistical inferences were derived from two tail trials and the significance level was established at $\alpha = 0.05$. Fisher exact test and chi square test used as appropriate to compare anemic and non-anemic as well as malnourished and non-malnourished children.

Ethical approval

The study was approved by the Regional Research Committee of the Governorate of Muscat (Province). Informed consent was obtained from each mother prior to the data being collected.

Results

The mean age of mothers was 30.17 (SD: 4.8), with the majority attending school (94.5%) and unemployed (71.3%). (**Table 1**)
Overall, 181 children were enrolled. Eighty five percent (n = 154) were between 11 and 13 months. The majority were born to normal birth weight (89%) and their nutritional status was normal (88.4%). Blood collected from 87.8% (n=159) of children to test for Hb with the mean level of Hb was 10.8 (SD: 0.99). (**Table 1**)

Table 1: Mothers' and children's Characteristics

		Number	Percentage (%)
Mothers' characteristics			
Age	Mean:30.17 SD:4.880		
Educational level	Read and write	10	5.5
	High school diploma	69	38.1
	Undergraduate education	46	25.4
	Higher education	56	30.9
Working status	Housewife	129	71.3
	Employee	52	28.7
Infants and children's characteristics			
Age group	<12 m	19	10.5
	12-13 m	148	81.8
	18 m	14	7.7
Gender	Male	87	48.1
	Female	94	51.9
Birth weight group	>3 Kg	97	53.6
	2.5-3.0 Kg	64	35.4
	< 2.5 Kg	20	11
Hemoglobin Level	Within normal	71	44.7
	Low Hb	88	55.3
Nutritional status	Normal	160	88.4
	Underweight	10	5.5
	Overweight/obese	11	6.1

The 6-month EBF was reported in 9.9% (n=18) of the sample. Among children one year of age and younger, 23.3% (n=23) use infant formula. There is a significant correlation between the EBF and the mother's employment status (p=0.01), but not with the mother's educational attainment (p=0.75). Approximately 10.5% of mothers attempted breast pumping, which was not related to their professional status or educational attainment.

Table 2: Weaning Practice

		Number	Percentage (%)
Type of food	Blended/mashed special food	76	42.0
	Family food	91	50.3
	Both	14	7.7
Caregiver (person responsible for feeding and taking care of baby)	Mother	155	85.6
	Grandmother	23	12.7
	Nanny/housemaid	3	1.7
Feeding frequency	On demand	140	77.3
	Scheduled	41	22.7
The first food type given to baby to introduce solid food	Commercial food	86	47.5
	Starch	93	51.4
	Cereals	2	1.1
Type of Snack usually given	Fruits	142	78.4
	Others	39	21.6
Sugar is added to baby food	Yes	124	68.5
	No	57	31.5
Salt is added to baby food	Yes	123	68.0
	No	58	32.0
The baby is given herbal supplements	Yes	15	8.29
	No	166	91.7
Vitamins/mineral supplements	Yes	36	19.9
	No	145	80.1

The dietary group consumed daily consisted of cereals in 58% (n=105), fruit in 56% (n=101), vegetables in 50% (n=90) and approximately 38% (n=69) reported a daily source of protein. (**Table 2**)

Most mothers began with starch/cereal 48.1% (n=87) as a first supplement. However, we found that 28.2% (n=51) of the mother began consuming commercial products. In addition, 21.7% (n=39) provided commercial food as the principal daily snack. The primary snack served by 55% (n=99) was a fruit /fruit juice.

Protein intake was not significantly associated with the level of Hb (p = 0.26). However, it was linked to the nutritional state of the child (p=0.013) and all children whose emaciation did not consume a source of protein most of the time.

Table 3: Infants and Young Children Feeding Indicators

		Number	Percentage (%)
Breastfeeding Indicators			
Exclusive breast feeding period	No exclusive BF	15	8.3

	<4 months	90	49.7
	4- 5 months	56	30.9
	6 months and above	20	11.0
Introduction of Solid Foods (Weaning)	Before 6 m	107	59.1
	At 6 m	72	39.8
	More than 6m	2	1.1
Complementary Feeding Indicators			
Minimum dietary diversity	Yes	126	69.6
	No	28	15.5
Minimum acceptable diet*	yes	74	40.9
	No	80	44.2
Minimum meal frequency	Yes	90	49.7
	No	91	50.3

By the third month of age, only 49.7% of the sample retained exclusive breastfeeding and the rate declined with age. Infants received relatively diverse foods, as 69.6% of the sample size consumed four meals or more. In contrast, only 49.7% were consuming the recommended number of meals.

Discussions

The importance of breastfeeding to infant health has long been established, but exclusive breastfeeding has declined for six months. In our study, there was a significant relationship between maternal employment and exclusively breastfeeding duration. Another conclusion was that protein intake was related to the nutritional state of the child.

Exclusive breast-feeding during 6 months.

In this study, it is alarming to note that only 9.9% of infants have been breastfed for 6 months. Similarly, numerous studies in other countries have reported lower rates of exclusive breastfeeding (18.9% in Qatar), (29.9% in rural Egypt), (16.8% in the United States), (7.1% in Nigeria), (13.8% in Canada), (25% in the United Arab Emirates) [10-15]. The WHO recommended to raise the worldwide rate of exclusive breastfeeding to 6 months, bringing it to 70% by 2030 [7].

A study in Sri Lanka reported high rates (65.9%) of exclusive breastfeeding at 6 months and justified this through a strong breastfeeding initiative in the country. Since its implementation, the Breastfeeding Code has been strengthened by ongoing monitoring of the violation of the Code by a committee of experts and officials [16].

Low rates of exclusive breastfeeding for six months were associated with cesarean birth, breastfeeding problems, young mothers, and smoking during pregnancy, employing mothers and health education during pregnancy, absence from the maternal clinic during pregnancy, exposure to commercial milk substitutes [10-14,17].

In this study mother employment status was the sole factor influencing exclusive breastfeeding for 6 months, and it similar with findings in other studies [1,10,14]. Not surprisingly, since most working mothers are on maternity leave for four months or less, and therefore they are obliged to introduce infant formula earlier as a breast milk substitute, which is consistent with our conscious theory. In some of our hospitals, there's an unwritten agreement to give mothers one hour of breastfeeding, in that sense, a working mother may have one hour of work to go home and breastfeed her infant for the first six months. However, in that study, the authors did not investigate whether mothers who worked in the study sample had such a privilege.

One way to support mothers who are working to maintain exclusive breastfeeding is to encourage breastfeeding. In this study however, we did not explore the concept of breast pumping and the barriers that mothers face if they wish to do so.

Introduction of Complementary Feeding

While the National Guidelines recommend the introduction of supplemental nutrition after 6 months. The majority of mothers (59.1%) that participated in the study began feeding before the recommended age.

In a study conducted in the United Arab Emirates (UAE) [17], most mothers reported being pregnant to begin to eat solid food. The other reasons given were that breast milk was insufficient and that the infant refused to breastfeed.

The early introduction of solids found in this study is not a one-time incident, but a pattern that has been apparent in many countries in the Middle East and beyond. For example, 62.5% of women introduced food to their infants before the age 4 months [18], 65% of women started feeding solid foods at the age of 3 months in the United Arab Emirates [19] and 41.6% in Lebanon [5].

The factors that trigger early food introduction are numerous, however, the key findings of this study were: the influence of parents/family, especially the maternal grandmother (59.8%), followed the reasons for the baby [18]. Unsurprisingly, the majority of mothers followed the advice of family members, since the communities of Oman are closely connected and composed of complex relationships. What is surprising is that the return to work of mothers was not a strong incentive for the introduction of solid food. This was different from the findings of Batal M et al 2010 [5], which found a strong link between maternal employment and the early introduction of solid food.

Minimum Dietary Diversity (MDD)

A minimum food diversity score is an indicator developed by WHO to assess nutrition for infants and young children. It refers to the consumption of four or more food groups from the seven food groups in infants and children, and is positively associated with nutrient adequacy in the diet [9]. In this study, 82% of infants met minimum standards for food diversification. This result is consistent with what was observed nationally (80.7%) [20]. Furthermore, this is higher than what was found in a recent study in Abu Dhabi, United Arab Emirates [17], where only 59.9% of infants reached the minimal requirement for a varied diet.

Cereals (58%), fruits (56%), vegetables (50%) were the mother's preferred food groups for feeding their infants in this study. Mothers believed those foods were the easiest to digest by the baby. This similar to a study done in an agrarian society in Southeast Ethiopia , where grains, roots and tubers were the most consumed food group [21] these were most preferable because mothers believed that they are easier to digest by the babies. The WHO guidelines emphasize the importance of exposing the baby to a variety of foods when they reach the recommended age for

introducing solid foods. The WHO also stresses the inclusion of protein foods in the baby's diet as a means of preventing iron-deficient anemia [22].

The consumption of sugar was found in 68.5% of the sample, these results are contrary to the world recommendations not to introduce sweet foods in infants and young babies, as this might affect their acceptance of other foods.

Minimum Meal Frequency (MMF)

The minimum meal frequency for breastfed children, 2 times for infants 6–8 months and 3 times for children 9-23 months. For non-breastfed children, minimum meal frequency is 4 times for children 6-23 months [9].

In this study, 53% of infants satisfied the minimal frequency of meals. This was lower than the national rate (64.5%) and in Rural Northern Ghana [23], while lower than, 58.2% in Indonesia (53%) in the age group 6-11 months [24], and in Ethiopia 50.4% [25].

For studies on factors influencing Minimum Meal Frequency [25], caregiver behaviour, mother's education, consistency of appointments at mother's clinic and mother's age had a significant influence [25]. Similarly, our study revealed that the mother's educational level had a positive effect on the frequency of meals given to the baby. Since educated mothers are eager to find the optimal means to take care of the nutrition of their infants. Education could play an important role in maternal education.

Iron deficiency Anemia

With the national definition of Hb cutoffs, which classifies Hb lower than 10.5 mg/DL as a state of Iron deficiency Anemia (IDA) [26], the prevalence of IDA was 17%. However, when the WHO IDA classification was used [27], the prevalence of IDA increased to (40%), mostly in the 9-12 month age group, which could be attributed not achieving the required amount of meals and minimum diversity of the diet given to the babies. Mother's age also had a strong influence on Hb levels, as iron deficiency anemia was more common in infants of young mothers (aged 20 to 29) when compared to older mothers (30 years and over).

Another factor affecting Hb levels was the length of exclusive breastfeeding, with infants who were not exclusively breastfed more likely to have iron deficiency. This underscores the importance of developing the message about the benefits of exclusive breastfeeding for the first six months.

Iron deficiency anaemia is a global trend, similar to a recent study in Saudi Arabia [28] 49% of infants examined had iron deficiency anaemia without significant gender differences. Using the same threshold, 49% of infants under 6 months of age in Nepal were diagnosed with iron-deficient anemia [29].

Malnutrition

In this study, only weight for height was investigated, resulting in emaciation and overweight and obesity. Most of the sample (88.4%) was in the normal range, and only 5.6% of the sample was emaciated and 6.1% were overweight and obese. Globally, under nutrition is the most pressing issue facing infants and young children [30]. The National Nutrition Survey in Oman [31], showed that under-weight (11.2%), stunting (11.4%) and wasting (9.3%) is the most pressing problem facing infants and young children under 5 years of age.

Limitation

The study has potential limitations. Besides being an observational study subject to bias and confounding effects. The results of this study should be viewed in light of certain other limitations. The first is the selection of mothers, but all mothers were invited to attend, but not all were accepted.

The second limit is the age of infants chosen to be around 9 months to avoid recall bias, however, it was not helpful to conclude on the impact of withdrawal practices on hemoglobin levels. Studies of withdrawal practices affect the development of anemia after the time of physiological anemia to be taken into consideration. The latter concerns, lifestyle variations and believes that mothers living in more civilized cities and villages through the governorate of Muscat. Studies, which shed light on this particular point in terms of withdrawal practices are needed in the future for more effective health education programmes.

Conclusions

This study demonstrated that Oman faces challenges in implementing the global guidelines on infant and young child nutrition. While the MOH efforts are well documented, there are still areas where community enforcement is lacking. The duration of exclusive breastfeeding was significantly correlated with the employment status of mothers. Furthermore, the protein intake was significantly related to the nutritional state of the child. Efforts should be stepped up to understand an ongoing the barriers faced by mothers in implementing the guidelines, and only then will we be able to fully implement them.

Declarations

Data Availability

The datasets used in this study are available from the corresponding author on reasonable request.

Ethical Approval

Ethical approval for this study was obtained from the Regional Research Committee of the Governorate of Muscat. This study does not contravene the internal institutional review board and follows the Declaration of Helsinki.

Consent

Informed consent was obtained from each mother prior to the data being collected. The participants who agreed to participate were well informed about the study.

Conflicts of Interest

The authors declare no conflicts of interest.

Authors' Contributions

HA, SA and FA conceptualized the project and conducted initial background research, HA, SA and FA planned and conducted the formal analysis and validation, HA, STA, SA and FA interpreted the results, STA led the writing (original draft and editing) of the manuscript, and HA, STA, SA and FA supervised the project. All authors approved the final article.

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