

Implementation of the WHO Multicentre Growth Reference Study in Oman

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Abstract

The World Health Organization (WHO) Multicentre Growth Study (MGRS) Middle East site was Muscat, Oman. A survey in Muscat found that children in households with monthly incomes of at least 800 Omani Rials and at least four years of maternal education experienced unconstrained growth. The longitudinal study sample was recruited from two hospitals that account for over 90% of the city's births; the cross-sectional sample was drawn from the national Child Health Register. Residents of all districts in Muscat within the catchment area of the two hospitals were included except Quriyat, a remote district of the governorate. Among the particular challenges of the site were relatively high refusal rates, difficulty in securing adherence to the protocol's feeding recommendations, locating children selected for the cross-sectional component of the study, and securing the cooperation of the children's fathers. These and other challenges were overcome through specific team building and public relations activities that permitted the successful implementation of the MGRS protocol.

Key words: Anthropometry, breastfeeding, child health, child nutrition, growth, growth monitoring, growth references, infant feeding practices, Oman

Introduction

The Middle East site of the World Health Organization (WHO) Multicentre Growth Reference Study (MGRS)

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was the capital city of the Sultanate of Oman, Muscat. Oman is located at the southeastern corner of the Arabian Peninsula. The city overlooks the Arabian Sea and the Persian Gulf. Its population resides at altitudes close to sea level. Of the country's 2.5 million inhabitants, more than a quarter reside in the capital area. About half of the resident population in Muscat (55%) is Omani [1], the remainder being expatriates. Muscat's population is relatively affluent and has ready access to highly developed preventive and curative health services.

Ninety-six percent of births in Muscat take place in two hospitals: Royal (4,969 births in 2001) and Khoula (3,548 births in 2001) hospitals [1]. These births include high-risk pregnancies that are referred from outside the capital area. Both hospitals serve a clearly defined catchment area that includes most of the women resident in Muscat. All communities within the catchment area were included in the study except Quriyat, a remote district of the Governorate.

A survey was conducted to identify socioeconomic, demographic, and behavioral characteristics of the subpopulation within Muscat whose children's linear growth is unconstrained by social and other environmental conditions [2]. The mothers of 336 children aged 28 to 43 months were selected from the national Child Health Register and interviewed. The children's weights and heights, the maternal height, child feeding practices, and the families' socioeconomic status were assessed. The participants' potential willingness to participate in the MGRS was also ascertained. The survey had a refusal rate of 0.1% [2]. The survey results demonstrated that more than 20% of those interviewed were able to follow MGRS feeding recommendations. The survey also identified specific socioeconomic status indicator cutoffs of families whose children experience unconstrained growth in early childhood. These were a monthly household income of at least 800 Omani Rials (US\$2,083) and at least four years of maternal education. Mobility was low, but some families (39%) usually traveled out of Muscat on vacation for short periods during the summer months.

Planning phase

Study timeline and preparatory activities

The initiation and duration of the key phases of the study are summarized in figure 1. Approval to recruit from the two participating hospitals was obtained from the Directors General of the Royal Hospital and Muscat Region (for Khoula Hospital). Members of the research team met with the chief nurses and the heads of the maternal and pediatric units of each hospital to explain the aims and procedures of the study and their respective roles in its successful implementation, especially in facilitating subject recruitment and the breastfeeding of newborns.

Study teams

The study group was composed of three field teams—the screening, follow-up, and lactation support teams—with their respective supervisors and quality control staff. The data management team based at the local coordination center was supervised by the site data manager and his assistant. The coordination team was made up of the site's principal investigator, a research associate, the supervisors and quality control staff of the three field teams, the data manager and assistant, a pediatric consultant, and a breastfeeding adviser. The field teams were formed for functions defined by the longitudinal study, but two of them implemented the cross-sectional study: the lactation team to screen and the follow-up team to interview recruited subjects and take anthropometric measurements. When the cross-sectional component began, lactation counseling activities were nearly completed, and the volume of longitudinal follow-up visits was low enough to accommodate the additional visits. The supervisors and quality control staff members fulfilled their functions in positions determined by local needs at different stages of the implementation of the study. The pediatric consultant defined the neonatal morbid-

ity exclusion criteria and held meetings with the pediatricians of the two hospitals to secure their support for the implementation of the study. The Muscat Region Director General provided key logistic and personnel support for the implementation of the study.

Six nutritionists were recruited to the screening team. This group worked in pairs and rotated between the hospitals. An International Board Certified Lactation Consultant trained nine nurses from the maternal and pediatric wards of the two hospitals, four of whom were recruited as lactation counselors for the study. Each counselor was assigned to specific residential areas. Eleven nurses and dietitians were recruited to form five working pairs of the follow-up team. One member of each pair was assigned permanently to a specific residential area, and the other six were rotated every two months. Three part-time data entry clerks worked on the data management team, and three part-time study secretaries were responsible for day-to-day administration and coordination functions (fig. 2).

Training and initial standardization of study teams

The longitudinal screening and follow-up teams were trained to make anthropometric measurements by a member of the MGRS Coordinating Centre and standardized against the WHO lead anthropometrist before the start of data collection. All interviewer teams were trained to administer oral interviews and complete questionnaire forms with the aid of the interviewer guides. Six members of the follow-up team were trained to perform motor development assessments. In addition to the overall administration of the project, the secretaries were trained to coordinate the day-to-day activities of the various teams and to maintain study registers and participation flux charts.

Adaptation of study materials and procedures

The MGRS Manual of Operations was adapted to the Omani context, and all questionnaires were translated

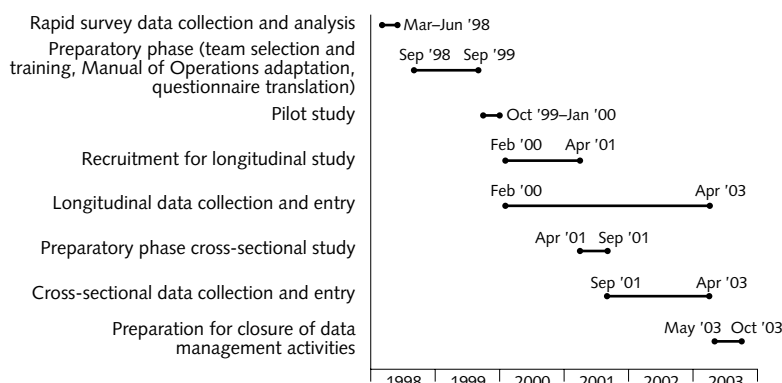


FIG. 1. Study timeline

into Arabic and back-translated into English at WHO headquarters in Geneva [3]. The interviewer guides were also translated into Arabic. Gender segregation is the norm in Oman. Thus, the availability of men during home visits was often low, and the fieldworkers, all of them female, were often not permitted to take their measurements. Therefore, two men were trained to measure adult weight and height, and the fathers had the option of coming to the local coordination center or were visited at work or at the health center nearest their home for these measurements to be taken.

Public relations activities

Media coverage, mostly by newspapers and radio, was secured when the study was launched and in the initial phases of the cross-sectional component. Despite these efforts, the study experienced a high refusal rate. To address this problem, the public relations officer in one of the hospitals assisted the longitudinal screening team by meeting with fathers during afternoon visiting hours and encouraging them to participate. Occasionally a male member of the coordination team would also talk with a reluctant father about the importance of taking part in the study.

A booklet explaining the importance of breastfeeding and offering practical advice on how to do it successfully, an informational leaflet describing the aims and

procedures of the study, and letters requesting fathers' and employers' collaboration were distributed. A study newsletter in Arabic was also distributed to all families recruited in the longitudinal component. Another newsletter in English was published for hospital and health clinic staff and other key supporters.

Two receptions were held for the longitudinal study participants at which gifts were given to all the children and their mothers. This was done to maintain the group's morale and thank the participants for their commitment to the study. Discount cards to shops and eateries were also provided, and the coordination team helped arrange doctor's appointments for enrolled children when required. MGRS seals also were placed on the children's health cards. This accorded them priority status at health centers. The mothers also were given tokens of appreciation at the end of the two-year follow-up.

Implementation of the longitudinal study

Sampling strategy

The recruitment target was set at 6 to 8 babies per week in order to enroll 312 children over 12 consecutive months. High ineligibility and refusal rates in the pilot phases of the study demonstrated the need to screen

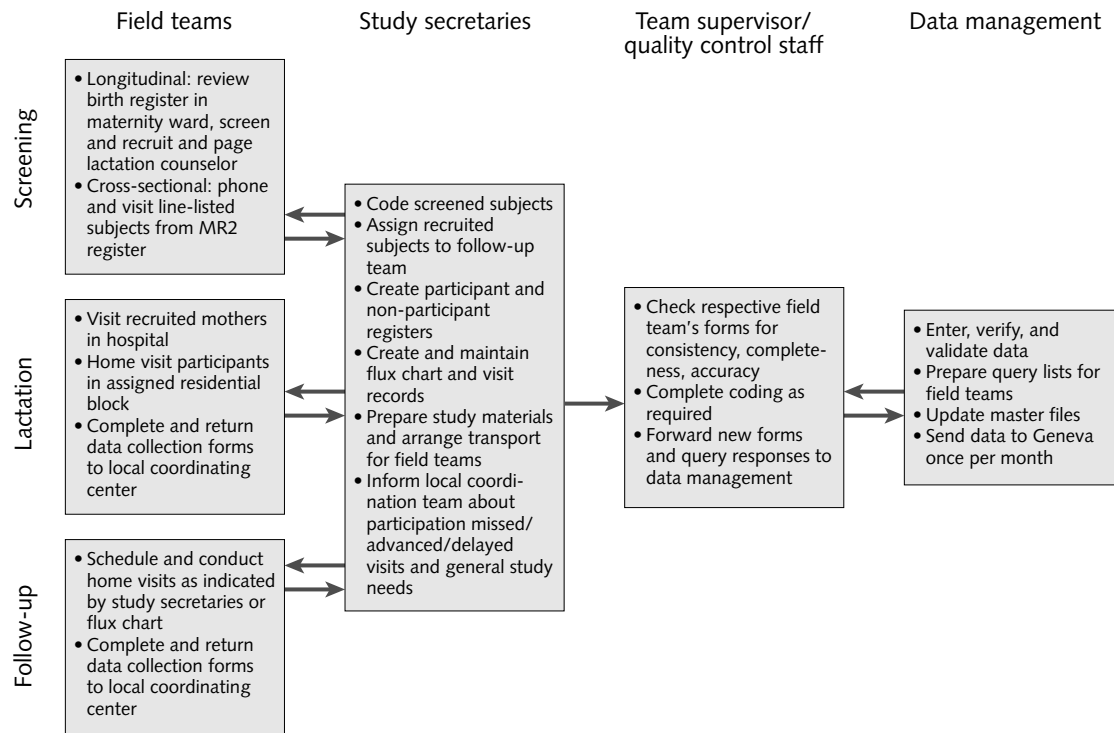


FIG. 2. Team coordination flow chart

all births in order to meet the sample size target. A weekly enrollment ratio of 4:3 from the Royal and Khoula hospitals was decided on to reflect the number of births in each hospital.

Screening and enrollment

Screening was done twice daily in each hospital, at 8 am and 8 pm Saturday through Wednesday. All children born in the previous 12 hours were screened. Screening stopped at each hospital when that hospital's weekly quota was met, but the quota was sometimes exceeded to compensate for recruitment shortfalls in previous weeks. All babies admitted to the Special Care Baby Unit for more than 24 hours were excluded, unless the unit's attending physician indicated that the infant's diagnosis would not affect growth adversely. The perinatal morbidity exclusion criteria are summarized in table 1. Only oral consent was obtained at screening in most cases because of the disinclination in most families to give written consent.

Follow-up logistics

The enrolled subjects were listed in the study register at the local coordination center and assigned for follow-up to the team responsible for their residential area. Each mother was followed throughout the study by one nonrotating member of the follow-up team to provide stability. Motor development assessment was done from the age of five months by members of the follow-up team on the same schedule as the follow-up visits.

Lactation support and complementary feeding

The lactation counselors visited the enrolled mothers within 24 hours of delivery to ensure successful initiation of breastfeeding and reconfirm the mothers' willingness to participate. They maintained a 24-hour

hotline, seven days a week, to respond to acute breastfeeding problems and answer the mothers' questions and concerns. The lactation team supervisor assisted with difficult lactation problems and periodically made home visits to support the mothers, foster compliance with breastfeeding guidelines, and enhance the mothers' confidence in the study team. The MGRS in Oman adopted the complementary feeding guidelines developed by the Ministry of Health. A booklet containing these guidelines was distributed at the five-month visit (table 2).

A list of eligible families who refused to participate, were unwilling to follow the MGRS breastfeeding requirements, or dropped out of the study while the child was an infant was generated for follow-up at the child's first birthday. A random sample of 72 was selected and visited by the follow-up team to obtain anthropometric measurements, as outlined in the MGRS protocol [3].

Implementation of the cross-sectional study

Sampling strategy

The sample for the cross-sectional study was drawn from Child Health (MR2) registers in the 12 health centers that serve the population in Muscat. Investigations done in preparation for this study component established that 93% of the children born in the Royal and Khoula hospitals were included in the MR2 register at any 1 of the 12 health centers. The preparatory investigations also tested the ability of the MR2 registers to provide a random sample of children aged 18 to 71 months similar to that recruited for the longitudinal component of the study. Only 72% of a sample drawn from the 1995 and 1998 MR2 registers could be traced, and nearly 75% of the families had more than one child in the age range required (both nuclear and joint families). Additional resources were required to increase the contact rate so as to screen at least 80% of the target population, and the latter finding revealed the need to expand the sampling frame, since only one child per household would be eligible for the study.

After multiple births and births to expatriates had been excluded, a master list of 24,000 children aged 18 to 71 months was drawn from the 12 MR2 registers. The eligibility and consent rates observed in the preparatory phase of the study indicated that 8,000 children should be screened to recruit the required number (1,400), and therefore a random sample of 8,000 from the master list was selected for contact.

Screening, enrollment, and survey logistics

The mothers were contacted initially by telephone to ascertain the presence of a potentially eligible child.

TABLE 1. Local exclusion criteria for the Omani site

Term	Definition
Perinatal morbidity	Admitted to Special Care Baby Unit for more than 24 hours, or information on the infant diagnosis sheet completed by attending physician identified a disease affecting growth
Intention to breastfeed	Mother unwilling to try to breastfeed for at least four months
Socioeconomic status	Household income less than 800 Omani Rials (0.384 OR = US\$1) or maternal education less than four years

The child had to be within the targeted age range, to have been breastfed for at least three months, to meet the residency requirements, and to have an Arabic-speaking mother. Consenting eligible families were visited in their homes to complete the full screening interview. When the telephone number was out of service or the call went unanswered, the family was sought at the physical address indicated in the MR2 register. The four members of the screening team each covered the same residential areas assigned to them for lactation counseling in the longitudinal component. Several efforts were set up to maximize the contact rate for screening. One team member was employed full-time to obtain additional contact information on subjects who could not be contacted by telephone or at the listed home address. Computerized registers maintained in the 12 health centers and in the city's principal obstetrics/gynecology clinic, where all women in their third pregnancy trimester are attended to, were reviewed. Health educators from each of the health centers, voluntary support groups, and the areas' wali or sheikhs also assisted in locating those who could not be contacted. These collaborative efforts were key to achieving an 80% contact rate. Two staff members were added a few months into the data collection period to assist with recruitment. At the local coordination center, the recruited subjects were assigned to the follow-up team working in their residential blocks for the home visit. The follow-up team visited each household once to administer the cross-sectional survey interview and take anthropometric measurements.

Standardization, quality control, and data management activities

Throughout the data collection phase, the anthropometry and motor development teams participated in bimonthly (every two months) standardization sessions and received remedial training if their performance deviated from MGRS norms. The anthropometry standardization sessions of the screening team were conducted in the Royal Hospital maternity ward, and the follow-up team standardization sessions for both anthropometry and motor development were held in the Bowshar polyclinic. The children who participated in the standardization sessions of the follow-up team were recruited from well-baby clinics and from participants in the longitudinal component of the study. Standardization procedures are described elsewhere in this supplement [4, 5].

Quality control activities were also carried out as described in the MGRS protocol and Manual of Operations [3]. Telephone calls were made following all cross-sectional component screening visits, and the team supervisor made random repeat home visits to validate information that had been obtained by the fieldwork-

TABLE 2. Ministry of Health Complementary Feeding Guidelines, Oman site

<p><i>Continue frequent, on-demand breastfeeding, including night feeding for infants up to the 24th month</i></p> <p><i>Introduce complementary foods between the beginning of the 5th month and the end of the 6th month</i></p> <p><i>Increase food quantity as the child gets older:</i></p> <p>Provide infants 5–8 months old approximately 280 kcal per day from complementary foods</p> <p>Provide infants 9–11 months old approximately 450 kcal per day from complementary foods</p> <p>Provide children 12–24 months old approximately 750 kcal per day from complementary foods</p> <p><i>Increase feeding frequency as the child gets older, using a combination of meals and snacks:</i></p> <p>Feed infants 5–8 months old complementary foods 2–3 times per day</p> <p>Feed infants 9–11 months old complementary foods 3–4 times per day</p> <p>Feed children 12–24 months old complementary foods 4–5 times per day</p> <p><i>Gradually increase food consistency and variety as the infant becomes older, adapting the diet to the infant's requirements and abilities:</i></p> <p>Feed mashed and semisolid foods, softened with breastmilk, if possible beginning around 5 months of age</p> <p>Feed energy-dense combinations of soft foods to infants 5–11 months old</p> <p>Introduce finger foods (snacks that can be eaten by children alone) beginning around 8 months of age</p> <p>Make the transition to family food at about 12 months of age</p> <p><i>Diversify the diet to improve quality and micronutrient intake:</i></p> <p>Feed a high-protein diet such as meat, fish, or poultry, or legumes such as lentils, beans, peas, chickpeas, or yogurt daily</p> <p>Feed vitamin A-rich fruits and vegetables daily</p> <p>Use only iodized salt</p> <p><i>Practice active feeding:</i></p> <p>Feed infants directly and assist older children when they feed themselves</p> <p>Give each child a plate and a spoon, and encourage him or her to stay at the table during the mealtime</p> <p>Offer favorite foods and encourage children to eat when they lose interest or have depressed appetite</p> <p>Start new foods one at a time, and allow 4–7 days to observe for any possible food intolerance</p> <p>Include eggs and honey in the diet only after the child completes 12 months of age</p> <p>Do not offer more than two small coffee cups of juice per day, especially before meals, as it could decrease appetite</p> <p>Feed slowly and patiently and minimize distractions during meals</p> <p>Make mealtime a happy, pleasant time. Do not force the child to eat certain foods or finish everything on the plate</p> <p><i>Practice frequent and active feeding during illness:</i></p> <p>During illness increase fluid intake by more frequent breastfeeding and patiently encourage children to eat favorite foods</p> <p>After illness, breastfeed and give foods more than usual and encourage children to eat more food at each sitting</p>

ers. Data forms were checked for completeness and consistency by the interviewer and her team supervisor before being submitted for data entry. In keeping with the MGRS protocol, data were entered twice and validated by centrally prepared routines before being incorporated into the study master files [6].

Conclusions

The successful conclusion of the study required the overcoming of several particularly difficult challenges: a relatively high refusal rate, obtaining fathers' anthropometric measurements, securing the family's adherence to the feeding guidelines of the study, and locating families for the cross-sectional component of the study.

Of those eligible at screening, nearly a quarter refused to participate. In addition, almost a third of the mothers enrolled in the hospital for the longitudinal study rescinded their consent when contacted at home. This high refusal rate probably reflects the high value placed on privacy in Oman. In many cases, families were very hesitant to have people interview them at home, particularly when it involved the long-term commitment of two years. Often it was the child's father who refused consent after the mother had agreed to participate.

Participating fathers were requested to be available for at least one of the follow-up visits, but this often proved difficult and required making the adjustments

described earlier. Even when they were available, some fathers would not have their measurements taken by women, a fact that increased the logistic complexity and resource costs of the study.

Adherence to the protocol's feeding recommendations was difficult for mothers working outside the home. This was common in the professional class targeted by the study. Employers were contacted and requested to support working mothers to breastfeed their infants exclusively, e.g., by granting enrolled mothers compensated time off during the day. The large households common in Oman also proved challenging, because many individuals participate in child care. It was important, therefore, to counsel both the mother and other key family members.

Locating children selected for screening for the cross-sectional component of the study proved especially difficult. Many children on the master list, especially older ones, were no longer available at the addresses provided by the Child Health Register. Extensive efforts were required to locate these children. Even after telephone contact was established, missed appointments were common and locating potential subjects' homes was often difficult. Muscat is experiencing rapid growth that has resulted in a network of unpaved roads in both new and older neighborhoods.

However, the study was successfully implemented, thanks to the collaboration of many individuals and institutions and the tenacity of the field and coordination teams.

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