Growth And Development Of Saudi Infant And Pre-School Children

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ABSTRACT

A SURVEY OF Growth and Development of Saudi Infants and Pre-School Children is currently being conducted in Riyadh, with the objective of developing a growth chart for Saudi infants and pre-school children. Mixed longitudinal data on growth and anthropometric measurements are presented for 6400 infants and pre-school children from Riyadh, capital city of the Kingdom of Saudi Arabia. This paper focuses on field survey research design and some methodological aspects of the study: sample structure, sampling design and procedures for data collection are discussed.

INTRODUCTION

ANTHROPOMETRIC MEASUREMENTS of children at given ages in most countries are used as indicators of nutritional status. For example, growth of height, weight and other anthropometric measures reflect the nutritional status of a population, and thus are considered as sensitive indices of population health.

The study of growth or auxology has become an essential tool in investigation of children's health related problems, particularly in developing countries. The most important guidelines for child growth standards were developed by experts, based on a representative sample of the population which could be used in evaluation of child health as well as the health care system of the country[1].

Certain guidelines and criteria have been developed by experts in the field of auxology which are helpful in solving some of the theoretical as well as practical difficulties in initiating such a field survey research programme[2,3,4].

Differences in growth and maturity status between upper and lower class children are well-documented. Children born and raised in better-off circumstances are taller age for age and mature earlier than those from poor socio-economic backgrounds[5].

Children from various ethnic groups, from various socio-economic strata within an ethnic group, and from different geographic areas of the world shows relatively small differences in birth status and generally grow uniformly during the first three to six months of life. After six months of age, the height and weight of children from low social strata in developing countries lag behind those of children from developed countries, while those from the higher social strata compare favourably with children of developed countries[6]. The main differences in weight and height have their origin between six months and two years of age, for after these ages the differences between the better-off and poor children are relatively stable during the pre-school years. Sub-optimum nutrition, infectious disease and the interaction of the two are commonly involved as the most important environmental factors underlying the differences between well-to-do and poorer children. Cultural variation in behaviour is also a significant factor in the growth of pre-school children.

Growth is a physiological process that provides an excellent indication of health and of nutritional status. Infant growth is related to short term outcomes including survival, morbidity, and cognitive performance[7,8,9,10,11].

The main objective of this study is to construct physical growth standards for Saudi infants and pre-school children by identifying and measuring a statistically adequate sample of healthy and well-fed segment of Riyadh population, capital city of Saudi Arabia. To our knowledge, these are the first published growth data from Riyadh population to contain a true longitudinal component for infants and pre-school children.

MATERIAL AND METHODS

A RESEARCH TEAM composed of fourteen faculty members and researchers has been set up to carry out through all stages of the planning and implementation of the field survey as well as analysis of the data. Additional supporting research personnel composed of seven nurses-anthropometricians, seven female social workers, seven drivers, and five field supervisors, were recruited to help in executing the field work. It was decided that a sample size of 6,400 infants and pre-school children was required for taking anthropometric measurements including, height, weight, head circumference, chest circumference, and triceps skin-fold and mid-arm circumference.

In addition data on ecological, environmental and cultural factors are collected during the interviews. Information regarding feeding pattern, size of the household, and number of sibling is also being compiled.

A pilot study was carried out during May and June 1984. The actual field survey began in September 1984 and is still in progress.

Sample Structure and Sample Size

Before starting the actual survey in September 1984, the sample structure and the sample design had to be composed. This stage was proceeded by pre-listing of the Saudi households in Riyadh, and training of the field workers.

Based on the information compiled and analysed by the Central Department of Statistics, a sample size of 6,400 pre-school children would produce a valid and representative results of growth variables, with a standard error not exceeding 10 per cent.

According to the available population statistics for the Riyadh area under study, that is, the total number of pre-school (0-5 years old) children, represents about 20 percent of the current Riyadh population (approximately 200,000). Thus with a sampling fraction of 1/30, a sample of about 6,400 healthy and well fed pre-school children had to be randomly, and irrespective of demographic and socio-economic background of family to which they belong, included in the field survey.

Accordingly, the field survey has been programmed to be carried out by taking growth measurements of 6,400 Saudi pre-school children, equally divided between male and female, distributed among the various age groups as indicated in Table 1.

Table I:
Distribution of sample size by age and sex for the field survey

Age Group	Male	Female	Total
0-1 month	200	200	400
1-2 months	200	200	400
2-3 months	200	200	400
3-4 months	200	200	400
4-5 months	200	200	400
5-6 months	200	200	400
6-7 months	200	200	400
7-8 months	200	200	400
8-9 months	200	200	400
9-10 months	200	200	400
10-11 months	200	200	400
11-12 months	200	200	400
1-2 years	200	200	400
2-3 years	200	200	400
3-4 years	200	200	400
4-5 years	200	200	400
Total	3,200	3,200	6,400

Sampling Design

The sampling design is essentially based on quota sampling, using two interlocked quota controls; age and sex. On the other hand, in order to include an adequate and representative coverage of all socio-economic and demographic group of Saudi population living in Riyadh, it was necessary to introduce an element of randomness during the actual sample selection process. Otherwise, there would have been the possibility of bias arising in favour of certain socio-economic groups or other variables directly related to the subject matter under study.

Therefore, a stratified three-stage random sampling frame of Riyadh administrative areas and roads was established as follows:

Field work was carried out by the CDS staff to enumerate and number the administrative areas and roads of Riyadh. This field work included the outlining of administrative areas and dividing them into roads. It was decided not to use a method of sampling by area maps. Though in theory it is an excellent method, for the city of Riyadh there would have been some difficulty in identifying segments inside each area by using the map. This is because the segments are not numbered, besides there is no name for the land marks which could help in outlining boundaries of the segments. On the other hand road locating is easier because each road has a number and there are marks which could indicate the road limits on both sides. Thus it was preferred to use the method of areas and roads for sample withdrawing to facilitate the data collection operation.

The sampling withdrawing could be summarized as follows:

1. Riyadh was divided into 93 administrative areas. These areas were divided into 6 strata according to socio-economic homogeneity. The stratification was based on the information collected by the CDS.
2. In each stratum, the number of areas were identified and one-fifth of the areas in each stratum were chosen randomly to be included in the study. Initially, there were 6 areas in the first stratum, 12 in the second stratum, 16 in the third stratum, 15 in the fourth stratum, 7 in fifth stratum and 37 in the sixth stratum. Thus, based on random selection 17 areas out of 93 would be surveyed.
3. Each randomly selected area was further subdivided into roads in the 17 randomly selected areas. So as to obtain overall control the sampling fraction for the first stage was chosen randomly. After that the 224 roads were randomly selected to be considered for the study.
4. Each road was subsequently divided into smaller manageable blocks of approximately equal size and a sample of such blocks was randomly selected.

Field Survey Design and Procedures for Data Collection

A Sample of 40 effective interviews are allocated to each randomly selected block in order to provide an adequate geographical coverage of the city and consequently all socio-economic family backgrounds.

Within each block selected, a random starting point has been chosen and each team composing a pediatrician, a field supervisor, an anthroponetrician, and an interviewer have been asked to follow a predetermined zig-zag route calling at every other household encountered. The team establishes whether there are any children in a household in the age range 0-5 and if so, proceeds to the clinical examination of the child, the anthropometric measurements and completes the relevant questionnaire with the mother. In order to meet the required quotas, i.e. sex within the specific age groups, daily records of contacts and measurements taken are submitted to the field supervisors responsible for coordinating field operations. Clearly target quotas for the age group 1-5 years old are reached earlier, as the probability of finding children of this group is higher than for infants in the under-one-year group. The survey manager, therefore, maaintains up-to-date daily records of work completed and gives instructions to teams on which age groups fall short of the quotas allocated and directs their attention to such groups.

In view of the fact that many of the infants in the age group 0-1 month, particularly those only one or two weeks old, are likely to be in clinics or hospitals, a number of interviews, anthropometric measurements and clinical examinations are carried out in Well-Baby Clinics and Maternal-Child Health Centers. Accordingly, if the quotas for the age group 0-1 month is not reached, the teams are instructed to continue interviewing in Well-Baby Clinics and Maternal-Child Health Centers which have been previously randomly selected.

These methodological procedures which are being implemented throughout the administration of the field survey have had a number of advantages over other methods, the most important of which are the following:

1. All children covered by the survey are given more or less the same chance of being selected in the sample, irrespective of place of residence and socio-economic and other characteristics of the family. Consequently, the survey result will be more representative of the environment.

2. It ensures control over the sample size in each group within males and females, thus enabling a meaningful statistical analysis of results for each sub-group separately.
3. Organization and control of field operations are more effective and simplified, resulting in a saving of time and resources.

PILOT SURVEY

THE FIRST draft of the research protocol was tested during the pilot survey which was carried out in the month of May and June 1984 in Riyadh Children & Maternity Hospital and in one of the Riyadh administrative areas referred to as Olaya. The main objective of piloting the protocol was to ensure that the questionnaires are eliciting the required information and that they contain no unclear or ambiguous points.

The pilot scheme was carried out under the supervision of one field manager and three field supervisors, with the participation of three pediatricians.

The anthropometricians and the interviewers were divided into seven teams. Two teams were assigned to the children and Maternity Hospital and five teams were assigned to carry out the pilot study in the Olaya Community.

Each team was equipped with a Harpenden Anthropometer, skinfold, stadimeter, infant-measuring table, tape measure and weighing machine.

All the families included in the pilot survey were Saudis. As for infants and children, only single live born infants and healthy children were measured. Infants and children born prematurely and children with major malformation and chronic disease were excluded.

Throughout the pilot survey, 200 families and their children were interviewed and measured. At the end of the survey certain changes were accordingly made in the research protocol and the revised version is being used for collection of data during the actual field work which is still in progress.

ORGANIZATION OF THE COMMUNITY RESEARCH TEAM AND TRAINING OF THE ANTHROPOMETRICIANS:

BEFORE LAUNCHING the pilot survey, the organization for field work and the hospital survey was specified in seven research teams, each composed of one interviewer, one nurse-anthropometrician, one survey supervisor and a driver. The interviewers were responsible for interviewing the mothers and the nurses-anthropometricians for taking measurements of the infants and children while the survey supervisors were responsible for assuring the quality of the collected data. There was also a team of pediatricians joining the seven measuring teams in rotation in order to supervise the taking of anthropometric measurements and to evaluate the infant and children health status.

All the nurses and interviewers were female which facilitated entry to houses.

Prior to the start of the pilor survey, the nurses-anthropometricians received on intensive training course in Children and Maternity Hospital and were trained in taking anthropometric measurement by two of the co-investigators-pediatricians for a period of one month. The nurses were specifically trained to use Harpenden stadiometer, anthropometer, skinfold caliper, infant measuring table and tape measure.

RESULTS

AS THE survey is still going on the data have not yet been analysed. But preliminary results are given as follows:

The range of gestational age among the sampled infants was between 35 to 42 weeks, with an average of 3-4 weeks. For most of the cases (66%) the gestational age was about 40 weeks.

The average Apgar score of the infants at one minute was about 9.03 with a range of 1 to 10 and the average Apgar score at 5 minutes was about 9.81 with an average of 5 to 10. In both cases, most of the scores were at the level of 10.

About 52.1% of the infants were boys and 47.9 percent were girls. Regarding the birth orders, the average was 3.8 within a range of 1 to 11. Most of the infants (44.1%) were born either as the first or the second child.

The range for the weight of the infants varied from 1850 grams to 4200 grams with an average of 3159.4 grams. Most of the new-borns were in the range 3000 to 3500 grams.

In terms of their height, the average height for the sampled new-borns was 48.96 cm, with a range of 31.0 to 56.0 cm.

OTHER ANTHROMETRIC MEASUREMENTS

THE AVERAGE head circumference of the infants was 33.95 cm, with a range of 29.0 to 37.8 cm. On the other hand, the average chest circumference was about 31.85 cm with a range of 25.9 to 38.0 cm. As for the mid-arm circumference, the average was about 101.2 mm, with a range of 76 to 125 mm. The triceps skin fold measures among the infant had a range of 2.4 to 8.4 mm, with an average of 4.02 mm.

ANTHROMETRIC SURVEY OF SAUDI PRE-SCHOOL CHILDREN

Fertility patterns

The average number of pregnancies of the present group of mothers was 5.00 with a range of 1 to 15. More than half of the mothers (55.4%) had less than 5 pregnancies in the past, however, there were some 13.2% of the mothers who had been pregnant more than 10 times and 56.5 percent of the mothers had become pregnant within the last twelve months. About 50.3 percent of the reported pregnancies resulted in live births. The average number of children born alive for every mother was 4.51. More than a quarter of the sampled mothers (28.1%) had at least one miscarriage throughout their reproductive life-time. About 62.5% of this group had had one miscarriage in the past, 28.5% had had two miscarriages, 7.8% had 3 and 0.8% had experienced six miscarriages. Some 9.4% of the mothers reported they had one miscarriage during the past twelve months. Only 2.2% of the mothers in this sample had experienced still-birth. The total number of still-births accounted for 0.5% of the total number of pregnancies. On the other hand, as far as infant mortality is concerned, about 8.47 of the mothers had at least one child who died before completing one-week (perinatal mortality), 4.2% had a child who died completing one month (neonatal mortality), 5.9% had a child who died before completing five years. The overall infant deaths (under one year of age) was about 5.2% of the total reported number of live births. Only 2% of the sampled mothers had had at least one abortion. The total number of abortions account for only 0.5% of the number of reported pregnancies.

DEMOGRAPHIC CHARACTERISTICS OF THE CHILD

THE NUMBER of boys and girls was almost equal — 48.1 percent boys and 51.9 percent girls. Overall, more than one-fifth of the children (22.5 percent) were the first-born infant, 18.7 percent were second-born, while 16.3 percent were third-born.

MOTHER'S AGE AND CHILD BIRTH AND ANTE-NATAL CARE

MORE THAN half of the mothers were between the age of 21

to 30 years at the time of birth of their sampled child. The overall range was between the age 15 to 45 years. During the pregnancy of the sampled children, about 92.5 percent of the mothers had had at least one antenatal care appointment. On average, the mothers had about 11.6 antenatal visits throughout the pregnancy period.

As for the place of delivery, 97.6 percent of the sampled children were delivered in hospitals, 2.2 percent at home and 0.2 percent in other places such as health centres.

The majority of the sampled children (67.0 per cent) were both bottle and breast fed. Those who were only breast fed accounted for 18.5 percent of the sample.

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TRAINING PUBLIC HEALTH ENGINEERS IN DEVELOPING COUNTRIES

(continued from page 14)

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