Factors Affecting Child Development in Madinah, Saudi Arabia

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Introduction: This paper addresses an important pre-requisite for promoting child health; namely the promotion of sound child development.

Objectives: The study aimed at identifying factors affecting child development in Madinah, Saudi Arabia.

Design: A cross-sectional study with a multi-stage stratified random sample of children.

Setting: Well-baby clinics of the primary health care centers in urban and rural areas of the Madinah region, North-western Saudi Arabia.

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Participants: A sample of 1219 “normal” children below the age of six.

Intervention: Tools used for the study were the modified and translated Denver Revised-Pre-screening Developmental Questionnaire (R-PDQ), and the Denver Developmental Screening Test (DDST) kit together with a social questionnaire. Logistic Regression analysis was used to show any significant association(s) between the study variables and the 104 developmental items in the R-PDQ.

Results: Eight variables were found to be strongly associated with each of the developmental items. Mothers’ education was found to be significantly associated with 21 developmental items. Number of children in the household was next to mothers’ education in its association with child development. Place of residence and gender were found to be significantly associated with seven and one abilities respectively.

Conclusion: Findings emphasized the importance of girls and mothers’ education as an aid in stimulating the development of their children and enabling mothers to prepare children for school. Adequate birth interval, and prolonged breastfeeding are recommended to enable mothers to care for their children, communicate with them and foster sound development. Scrutinizing the child’s home environment and involving parents in the developmental progress of their children are also considered important. More stimulation and educational play are recommended for rural children and male urban children.

Key Words: Child development, R-PDQ, Madina, Saudi Arabia

INTRODUCTION
The monitoring of growth and development is considered essential in any program that promotes child health since clinical signs and symptoms alone are unreliable in describing normal developmental variations or minor developmental delay. Early detection of disability requires comprehensive child health surveillance and developmental monitoring. The identification of the genetic and environmental factors that influence the development of a normal child is essential for the guidance of child health workers and the caring parents. However, tools ‘imported’ for use in developmental screening should be standardized to suit the community in which they are to be used.

The Denver Developmental Screening Test (DDST) was developed in 1967 by Frankenbourg et al, and validated in many studies. The DDST was successfully used in many countries and restandardized for more than 15 countries. The Denver Pre-screening Developmental Questionnaire (PDQ) was developed by modifying the DDST items into questions. In 1987, it was revised and modified into the Revised-PDQ (R-PDQ). The R-PDQ is used as a first stage screening to precede the application of further complicated and costly screening processes. The investigators translated, adapted and standardized the R-PDQ for use in the Kingdom of Saudi Arabia (KSA). The results of this standardization are being published elsewhere.

Factors affecting child development in KSA and other Arab countries and the variations in normal child development were addressed. The identification of these factors is essential in the planning of parents’ education, and the orientation of family physicians and pediatricians towards normal variation in child development in each community. Understanding of these factors would help health
Factors Affecting Child Development

workers to detect developmental problems and intervene early. The objectives of this study were to identify and analyze factors that affect child development in Al-Madinah region, North Western Saudi Arabia. Hopefully, this should fill an important gap in the literature and enable health personnel to take appropriate decision(s) on diagnosis and the management of developmental problems. It should also complement current efforts in the growth monitoring program in Saudi Arabia.

METHODS

Cross-sectional and longitudinal methods are used for developmental studies. The cross-sectional method suited the objectives of this study and was, therefore, used. The study population comprised Saudi children in Al-Madinah region, Saudi Arabia. For administrative purposes, Al-Madinah region was divided into 12 health sectors, four of which were in the vicinity of the city center (urban sectors), and five in the rural areas. The appropriate formula for calculating sample size was used with a standard error of 0.04 and confidence interval (CI) of 95%. This yielded a sample of 576 children a number, which was doubled to 1152 with the inclusion of rural children. A multi-stage stratified random sampling was applied to form the study sample. The urban primary health care centers (PHCC) (32) were divided arbitrarily into 6 different socio-economic levels. One PHCC was randomly selected to represent each socio-economic level. Since the law demands that every birth be reported to the PHCC, a list of all children within the catchment area of PHCC is available in the “Well-baby Clinic”. The study sample was derived from these lists using systematic random sampling. For a better representation of children in the community, children were invited to participate in the study regardless of how frequently they used the PHCC services.

The R-PDQ was chosen for standardization because of its qualities as a screening tool. Only mothers responded to the questions. Using Gregorian calendar, the date of birth of each child was taken from the PHCC records. The questionnaire included demographic information of the children. These included age, gender, place of residence, place of birth, birth order, number of children in the household, mother’s and father’s education and occupation; whether the child was in kindergarten or not, and the socio-economic level of the family. The latter was based on the Kuppuswamy score that utilizes father’s education, occupation and monthly income. The score was modified to suit the local community.

The inclusion and exclusion criteria were established before the study and only normal Saudi children whose ages ranged from 0-6 years with no obvious disability were included. Children with a birth weight of less than 2.0 kg (the WHO cut off point for normal birth weight) were excluded. Pre-mature, twin, breech or children born by a cesarean section were also excluded. Children with no acute or chronic health problems, as well as children of single parents were also excluded. Only one child from each family was included to ensure maximum variation in socio-economic backgrounds of children.

Children were taken in ten age groups. Since the development of children is faster in early infancy, than in childhood, the age groups were made shorter at the beginning, and longer towards the end of the sixth-year period (Table 2). A tally sheet was used throughout the fieldwork to monitor the number and gender of children included in each age group.

The study was conducted in 1996. Ten Arabic speaking nurses working in the “well-baby” clinic in Al-Madinah were trained on the administration of the Arabic R-PDQ and
the use of the DDST kit. One of the investigators who had himself received training at Denver, Colorado conducted the training. The DDST was administered according to the standard protocol in the presence of the mother. Evaluation of children’s drawings was done by one of the investigators to minimize inter-observer bias.

To test reliability, around 10% of the sample were repeated twice for children less than 18 months. This was reported once on the same child within one week and within 2 weeks for children more than 18 months of age. The second type of reliability was done when the nurse and one of the investigators administered the questionnaire to the same child. Logistic regression analysis was used to study relationship between the study variables and the achievement of each item in the questionnaire. Kappa statistic was used to test reliability.

Data were coded, processed, and fed into a personal computer. Analysis was done using EPI-Info, and SPSS software.

RESULTS
The response rate was more than 80% in most urban centers reaching 90% in some centers. The final sample included 1219 respondents. Table 1 shows their distribution according to their gender and place of residence. There were enough “Yes” and “No” responses to each question to enable us to draw inferences.

Table 2 shows the age distribution of children in the ten different age groups. Number and gender of children in each cell ranged between 46 and 77. Further stratification of data according to the study variables was statistically appropriate for comparison of the sub-groups. An exception to this was that less than 1% of the children went to kindergarten.

Of all variables entered into the logistic regression model, eight were found to be strongly associated with each of the 104 developmental items in the Arabic R-PDQ. Table 3 shows the number and type of items associated with the studied variables. Out of the eight variables associated with child development, mother’s education was related to 21 developmental items, eight of which dealt with language, six with gross-motor skills, four with personal social skills and three with fine-motor skills. It appears that a relatively low number of fine motor skills (3 items) were influenced by the mother’s educational background. Next to mother’s education in its association with children’s developmental abilities is the number of children within the household (19 items). The relationship was negative in 16 out of these 19 items. All the
Table 3: Factors strongly associated with developmental items in the four developmental domains

| Factor                  | Personal social items | Fine motor items | Language items | Gross-motor items | Total no. of items |
|-------------------------|-----------------------|------------------|----------------|-------------------|-------------------|
| Mother’s education      | 4                     | 3                | 8              | 6                 | 21                |
| No. of children in family | 6                     | 5                | 4              | 4                 | 19                |
| Place of residence      | 3                     | 4                | 2              | 4                 | 13                |
| Monthly income          | 1                     | 2                | 6              | 2                 | 11                |
| Father’s education      | 1                     | 3                | 1              | 2                 | 7                 |
| Socio-economic level    | 1                     | 1                | 2              | 2                 | 6                 |
| Gender                  | 1                     | 1                | 1              | -                 | 3                 |
| Father’s occupation     | -                     | 1                | 1              | -                 | 2                 |

Table 4: Logistic regression analysis showing developmental items strongly associated with place of residence

| Developmental item                  | β     | p-value | O.R.  | 95% CI          |
|-------------------------------------|-------|---------|-------|-----------------|
| Plays ball with examiner             | -0.72 | 0.003   | 0.51  | 0.29-0.81       |
| Walks up steps                       | -0.59 | 0.0001  | 0.554 | 0.36-0.85       |
| Tower of 8 cubes                     | -1.07 | 0.0001  | 0.34  | 0.20-0.56       |
| Imitates bridge                      | -1.96 | 0.001   | 0.14  | 0.08-0.24       |
| Draws a man - 3 parts                | -2.03 | 0.0001  | 0.13  | 0.05-0.34       |
| Backward heel-toe walk               | -1.49 | 0.001   | 0.225 | 0.09-0.57       |
| Draws an man - 6 parts               | -2.91 | 0.0001  | 0.05  | 0.01-0.26       |

OR=Odds ratio, CI = Confidence interval

Table 5: Logistic regression analysis showing the developmental item associated with child’s gender

| Developmental item                  | β     | p-value | O.R.  | 95% CI          |
|-------------------------------------|-------|---------|-------|-----------------|
| Draws a man - 6 parts               | 1.66  | 0.008   | 5.23  | 1.54-17.77      |

OR=Odds ratio, CI = Confidence interval

16 mixed developmental skills were found to be negatively associated with a higher number of children in the same household. Three items relating to dressing andundressing were positively associated with households with a higher number of children.

Table 4 shows more detailed results of the logistic regression analysis. The items that were strongly associated with place of residence are shown on that table. Table 5 shows the developmental skills associated with the child’s gender.

The results of the reliability tests done between the investigators and nurses were poor in 4 out of 104 items. When the R-PDQ items were repeated for reliability by one of the investigators and nurses for the same child, the best was in language, followed by fine motor, and then gross-motor skills. The poorest reliability was in personal-social items.

DISCUSSION
This study showed the effects of the studied factors on child development in Madinah. It was evident that abilities that are strongly associated with demographic and social skills such as drawing and cube building require the greatest stimulation. The mother’s education proved to have a significant impact on the child’s development. The study clearly showed that the higher the level of the mother’s education, the better the chances are for sound child development. Responses to the items were probably affected by cultural and
social differences. These findings are consistent with those observed in children in the Philippines and South African children in Cape Town. Mother’s with a higher level of education had offspring with more fine motor skills, but the association in our study was associated with only 3 out of 21 items. A possible explanation for this may be that the mothers may not be encouraging their children to exploit the benefits of their mother’s education to the full. It may be that the education of mothers in the community prepares them adequately for the important function of raising children. In the middle-eastern culture, parents could be loving but not necessarily stimulating. Delays in development may be due to the lack of exposure of children to a stimulating environment.

There was a negative association between the number of children in the household and items from all four developmental domains. Our findings are consistent with Molten’s observation on Cape Town children and observations on Filipino children. The possible explanation of this negative association may be that less attention is given to children in the larger families than those in small families. Though the acquisition of some developmental skills (not necessarily those in the R-PDQ), by a child may be aided by play with a large number of children, this may not help in the acquisition of advanced language and fine-motor skills.

Despite the fact that our study is in accord with other studies, it should be stressed that different criteria are used in different studies. Since non-Saudi children, and children with ‘risk’ factors were not included in the study sample, the findings cannot be generalized to cover the groups excluded. The variation in development in Saudi children in Al-Madinah reflects environmental rather than genetic factors. The genetic potential for child development is not significantly different from that of Western children as genotype differences in growth and development are minimal. Al-Madinah region is a vast melting pot of people from all over the world who settled there for religious reasons. This tends to moderate genetic and cultural differences among people, rendering the environmental factors in a child’s development greater significance.

The findings of this study emphasize the importance of girl’s education. It has been associated with reduced infant mortality, reduced birth rates, and improved nutritional and health status of children throughout the world. However, mothers and would-be mothers should also be educated on better ways of communicating, stimulating and teaching their children early. Curriculums in girls’ schools should include more concepts, and ideas on child care to better prepare the girls for their function as future mothers as well as help them prepare their children for school.

The findings from this study on the question of large number of children in the family indicate that there is a need for education on the spacing of children and prolonged breastfeeding. Studies have shown that a child born after an adequate birth interval of two or more years is not only heavier and taller than that born after a short interval, but also performed significantly better at school.

Urban children seem to be better with some skills particularly the fine-motor ones. It is possible that urban children are more likely to be exposed to stimulating and educational play. It may also be that families in the urban setting can afford to buy toys (including computer games) and certainly have more access to television sets than rural homes.

The strong association between the female gender and one of the fine-motor abilities, i.e., draw a man - 6 parts - can possibly be explained by the tendency of females to stay at home and concentrate more on fine-motor
skills than the personal-social or gross-motor skills in which male children do better.

There is a need, as Frankenburg indicated, for scrutinizing the child’s home environment. The advantages of involving parents in the developmental progress of their children should be considered when planning services for pre-school children. More attention should be given to rural children to help them to improve their fine-motor skills. The encouragement of kindergartens and educational play may also be of help.

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