



Factors affecting child development assessed by the Ages and Stages Questionnaire (ASQ) in an Arabic speaking population[☆]



Durriyah Sinno^a, Hani Tamim^b, Farah Faytrouni^a, Mohamad A. Mikati^c, Lama Charafeddine^{a,*}

^a American University of Beirut Medical Center, Department of Pediatrics and Adolescent Medicine, Lebanon

^b American University of Beirut, Department of Medicine, Lebanon

^c Duke University Medical Center, Durham, NC. USA

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1. Introduction

Early child development is a crucial determinant of an individual's potentials specifically health, education and economic status, throughout the life span [1]. Child development is a dynamic and sensitive process that is affected by many factors including genetic, environmental, psychological and socioeconomic factors [2,3]. Recently, global efforts have shifted to focus on the 2030 sustainable developmental goals (SDG) which highlight the importance of “nurturing care” in promoting early child development [4].

In low and middle income countries, 43% of children younger than 5 years do not reach their developmental potential due to poverty and stunting [5]. Other important factors affecting cognitive development are nutrition, gender and maternal education [6,7]. Mothers' schooling and vocabulary levels strongly predict the cognitive development of young children living in a poor environment [6]. In fact, both parents' education is determined to be an essential component to achieve a child's developmental potential [4].

Several studies from developed countries have addressed the impact of socio-economic status (SES) in particular poverty on children's cognitive functioning, [8] working memory, [9] impulsivity [10] and cognitive flexibility [11,12], while one study from the Arabic speaking region reports an association between children's intelligence quotient (IQ) and monthly family income [13]. Moreover, parental responsiveness, enrichment activities and family companionship are found to be the factors determining the association between SES and child inhibitory control and working memory [14].

In the particular setting of the Middle East and North Africa (MENA) region, the interplay between the above mentioned factors have not been extensively studied. Throughout history, people of the MENA region have been exposed to many cultures and languages [15]; in societies that remain multilingualistic to this date, children tend to learn more than one language during early infancy which may or may not affect their cognitive development; children exposed to more than one language at an early age show an advantage in their executive function skills compared to monolingual children [16]. The amount of conversation and interaction between parents and children has been associated with subsequent language, development and IQ scores. Lebanese children live in a mixed middle-eastern and western culture; they are exposed to a wide variation of child care practices from being cared for by parents and family members at home, to having home helpers mainly caring for them [17] to being placed at day care centers. Home helpers are usually foreigners who come from low socioeconomic backgrounds; many times they learn Arabic well after their employment, therefore they may communicate with children in their own language [18]. Another well-known detrimental factor is the amount of time a child spends on TV and electronics. TV viewing is correlated with more developmental delay and behavioral problems [19].

Therefore, we set to explore the factors affecting development of presumed healthy children in the particular context of Lebanon. We hypothesized that in healthy children, maternal education affects positively child development as in western societies and other factors may affect child development negatively in particular exposure to more than one language and to more TV viewing in addition to being cared for by

Abbreviations: AASQ, Arabic translated Ages and Stages Questionnaire; ASQ- II, Ages and Stages Questionnaire 2nd edition

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* Corresponding author at: P.O. Box: 11-0236, Riad El Solh 1107 2020, Beirut, Lebanon.

E-mail address: lc12@aub.edu.lb (L. Charafeddine).

Table 1
Children characteristics and mean developmental scores by domains.

| | | N = 733 N (%) | Overall Score | Communication | Gross motor | Fine motor | Problem solving | Personal Social |
|----------------------|-------------------------|---------------|--------------------|--------------------|--------------------|--------------------|--------------------|-----------------|
| | | | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) | Mean (SD) |
| Gender | Male | 385 (52.5%) | 233.1 (39.0) | 48.9 (12.5) | 52.4 (10.8) | 46.9 (12.7) | 47.9 (11.6) | 47.3 (11.4) |
| | Female | 348 (47.5%) | 239.9 (36.4) | 52.3 (9.5) | 51.4 (12.0) | 48.4 (11.7) | 49.2 (12.5) | 50.0 (10.1) |
| | | p-value | 0.02 | < 0.0001 | 0.24 | 1.00 | 0.15 | 0.001 |
| Age groups | 4 months | 84 (11.5%) | 238.4 (38.8) | 52.5 (7.9) | 50.7 (11.0) | 44.6 (14.5) | 48.3 (13.4) | 52.4 (8.9) |
| | 8 months | 94 (12.8%) | 234.9 (39.8) | 50.6 (9.2) | 42.8 (14.8) | 53.1 (10.1) | 49.7 (12.3) | 48.8 (12.2) |
| | 12 months | 98 (13.4%) | 221.6 (41.7) | 45.1 (10.2) | 48.5 (14.8) | 49.9 (10.1) | 45.6 (13.3) | 40.9 (12.0) |
| | 16 months | 83 (11.3%) | 227.8 (38.1) | 46.4 (12.3) | 54.9 (9.3) | 45.4 (12.8) | 46.6 (10.9) | 45.2 (12.4) |
| | 20 months | 98 (13.4%) | 232.8 (40.9) | 45.4 (16.4) | 55.4 (9.2) | 46.5 (11.5) | 47.6 (14.0) | 49.2 (11.5) |
| | 24 months | 93 (12.7%) | 244.0 (29.9) | 53.4 (9.2) | 53.9 (7.6) | 48.4 (8.8) | 48.2 (9.8) | 51.9 (7.7) |
| | 30 months | 84 (11.5%) | 240.3 (28.5) | 55.2 (8.5) | 54.5 (6.7) | 42.3 (13.7) | 48.9 (10.2) | 51.0 (7.6) |
| | 36 months | 99 (13.4%) | 250.4 (34.7) | 56.0 (8.2) | 55.1 (7.7) | 49.3 (13.0) | 53.2 (10.0) | 49.6 (8.5) |
| | | | p-value | < 0.0001 | < 0.0001 | < 0.0001 | < 0.0001 | 0.001 |
| Feeding type | Breastfeeding | 229 (31.3%) | 238.8 (36.0) | 51.7 (10.1) | 52.5 (11.3) | 47.9 (11.9) | 48.2 (12.2) | 49.0 (10.2) |
| | Formula with/without BF | 502 (68.7%) | 235.1 (38.8) | 50.0 (11.8) | 51.7 (11.5) | 47.4 (12.4) | 48.7 (11.9) | 48.4 (11.2) |
| | | p-value | 0.22 | 0.06 | 0.38 | 0.58 | 0.56 | 0.52 |
| Mother's Age (years) | ≤25 | 162 (22.6%) | 236.8 (39.1) | 48.4 (12.1) | 52.6 (10.2) | 47.9 (12.8) | 48.2 (12.5) | 49.1 (11.1) |
| | 26–34 | 399 (55.6%) | 234.0 (38.5) | 50.7 (11.4) | 51.3 (12.3) | 46.6 (12.5) | 48.2 (12.1) | 48.2 (10.9) |
| | ≥35 | 157 (21.9%) | 240.8 (35.3) | 52.0 (10.3) | 52.4 (10.6) | 49.9 (10.8) | 49.6 (11.4) | 48.9 (10.7) |
| | | p-value | 0.16 | 0.01 | 0.39 | 0.02 | 0.46 | 0.65 |
| Father's Age (years) | ≤30 | 155 (21.5%) | 234.3 (39.3) | 49.4 (12.1) | 52.3 (11.0) | 46.7 (12.7) | 47.4 (12.4) | 48.5 (11.3) |
| | 31–39 | 375 (51.9%) | 237.4 (37.5) | 50.7 (11.0) | 51.6 (11.8) | 48.3 (12.13) | 49.3 (11.6) | 48.8 (10.8) |
| | ≥40 | 192 (26.6%) | 235.0 (37.6) | 50.9 (11.3) | 52.1 (11.2) | 46.7 (12.1) | 48.1 (12.0) | 48.1 (10.8) |
| | | p-value | 0.61 | 0.42 | 0.83 | 0.24 | 0.21 | 0.76 |
| Number of children | 1 | 248 (35.0%) | 239.2 (37.5) | 50.8 (11.7) | 53.0 (9.8) | 48.3 (12.0) | 48.9 (12.9) | 49.4 (10.3) |
| | 2 | 243 (34.3%) | 236.2 (38.4) | 50.5 (11.7) | 51.9 (11.3) | 46.7 (12.9) | 49.0 (10.7) | 48.3 (11.4) |
| | 3+ | 218 (30.7%) | 232.4 (38.4) | 50.0 (10.6) | 50.8 (12.9) | 47.4 (11.8) | 47.3 (12.5) | 47.8 (10.9) |
| | | p-value | 0.16 | 0.74 | 0.10 | 0.36 | 0.24 | 0.24 |
| Mother's education | Elementary and below | 58 (8.0%) | 216.1 (48.4) | 44.9 (15.2) | 46.6 (14.4) | 44.4 (15.4) | 43.7 (16.4) | 45.7 (13.4) |
| | Middle and high school | 243 (33.5%) | 232.1 (41.1) | 49.0 (12.2) | 51.7 (11.8) | 46.3 (13.0) | 47.1 (12.7) | 47.7 (11.8) |
| | University and higher | 425 (58.5%) | 241.8 (32.8) | 52.3 (9.6) | 53.0 (10.3) | 48.7 (11.3) | 50.2 (10.4) | 49.5 (9.9) |
| | | p-value | < 0.0001 | < 0.0001 | < 0.0001 | 0.01 | < 0.0001 | 0.02 |
| Mother's work | No | 464 (63.3%) | 234.1 (38.8) | 49.7 (11.9) | 51.9 (11.3) | 46.6 (12.9) | 47.7 (12.2) | 48.4 (11.1) |
| | Yes | 269 (36.7%) | 240.1 (36.2) | 52.0 (10.1) | 52.0 (11.6) | 49.3 (10.8) | 50.1 (11.4) | 48.8 (10.6) |
| | | p-value | 0.04 | 0.01 | 0.96 | 0.002 | 0.007 | 0.63 |
| Care provider | Mother alone | 421 (57.8%) | 230.7 (40.0) | 49.2 (12.0) | 51.2 (11.9) | 46.4 (13.0) | 46.9 (13.4) | 47.7 (11.5) |
| | Mother and relatives | 107 (14.7%) | 245.0 (33.3) | 52.1 (9.7) | 53.1 (10.3) | 49.6 (11.5) | 50.9 (9.9) | 50.8 (9.6) |
| | Mother and helper | 63 (8.7%) | 241.2 (37.5) | 52.2 (9.9) | 50.5 (13.1) | 49.8 (10.2) | 49.1 (9.9) | 49.8 (9.3) |
| | Mother and daycare | 137 (18.8%) | 245.2 (31.1) | 52.6 (10.4) | 54.4 (8.4) | 48.9 (10.9) | 51.8 (8.3) | 48.90.4) |
| | | p-value | < 0.0001 | 0.003 | 0.02 | 0.02 | < 0.0001 | 0.04 |
| Language | Same | 368 (50.3%) | 230.2 (39.7) | 48.3 (12.4) | 51.2 (12.1) | 46.5 (13.0) | 46.8 (12.5) | 47.4 (11.6) |
| | Multiple | 363 (49.7%) | 243.2 (33.9) | 52.9 (9.3) | 53.0 (10.14) | 48.8 (11.3) | 50.4 (11.1) | 49.9 (9.7) |
| | | p-value | < 0.0001 | < 0.0001 | 0.03 | 0.01 | < 0.0001 | 0.001 |
| TV viewing | < 1 h | 472 (64.8%) | 238.9 (36.4) | 50.7 (11.1) | 52.4 (11.3) | 48.4 (11.8) | 48.7 (12.2) | 49.5 (10.4) |
| | > 1 h | 190 (26.1%) | 233.8 (38.6) | 51.0 (11.5) | 51.3 (11.4) | 46.6 (13.2) | 48.8 (11.4) | 47.6 (11.2) |
| | Does not watch TV | 66 (9.1%) | 229.5 (39.2) | 48.4 (11.6) | 51.7 (10.8) | 45.0 (12.2) | 47.4 (10.6) | 46.1 (11.4) |
| | | p-value | 0.07 | 0.25 | 0.49 | 0.05 | 0.68 | 0.02 |
| Income | < 1000\$ | 298 (48.9%) | 229.7 (39.3) | 48.6 (12.2) | 51.4 (12.0) | 46.0 (13.0) | 47.4 (13.7) | 47.1 (11.6) |
| | 1000–3000\$ | 174 (28.6%) | 241.1 (36.9) | 51.4 (10.4) | 51.9 (11.3) | 49.0 (11.4) | 49.1 (10.7) | 48.9 (10.4) |
| | > 3000\$ | 55 (9.0%) | 238.7 (37.3) | 51.1 (11.0) | 52.4 (11.1) | 49.0 (11.6) | 49.6 (9.1) | 49.5 (10.3) |
| | Not applicable | 82 (13.5%) | 234.3 (40.0) | 51.0 (12.5) | 51.2 (12.9) | 47.8 (12.0) | 48.5 (12.4) | 48.1 (11.6) |
| | | p-value | 0.02 | 0.05 | 0.91 | 0.05 | 0.41 | 0.23 |
| Place of Residence | Beirut | 151 (20.8%) | 238.2 (31.3) | 49.4 (10.3) | 52.4 (9.9) | 49.0 (11.3) | 47.7 (11.4) | 49.6 (9.8) |
| | Mount Lebanon | 261 (35.9%) | 231.4 (39.0) | 48.7 (12.1) | 51.3 (12.0) | 46.5 (13.2) | 46.5 (12.7) | 48.1 (11.1) |
| | Bekaa | 96 (13.2%) | 243.5 (37.7) | 54.1 (8.5) | 51.8 (12.5) | 50.2 (9.6) | 52.2 (13.4) | 49.8 (10.1) |
| | North | 55 (7.6%) | 217.2 (44.9) | 47.7 (13.6) | 50.4 (12.5) | 41.4 (13.7) | 46.6 (11.8) | 43.6 (12.7) |
| | South | 164 (22.6%) | 245.4 (34.9) | 53.1 (10.9) | 53.4 (10.5) | 48.9 (11.0) | 51.4 (9.4) | 49.6 (10.6) |
| | | p-value | < 0.0001 | < 0.0001 | 0.34 | < 0.0001 | < 0.0001 | 0.002 |

home helpers.

2. Methods

This was a secondary data analysis of a previously published study on the adaptation of the Ages and Stages questionnaire second version (A-ASQ-II) into Arabic [20].

Briefly, Ages and Stages Questionnaires 2nd edition (ASQ-II), is a standardized parent completed screening instrument that includes questionnaires for different age groups from 4 to 66 months. It addresses multiple aspects of development such as communication, gross

motor, fine motor, problem solving, and personal-social skills [21]. ASQ-II intervals for the ages of 4, 8, 12, 16, 20, 24, 30 and 36 months were translated to formal Arabic; face validity, field testing and reliability were done showing a high reliability (0.8–0.9) and internal consistency of the translated ASQ with a Cronbach alpha ranging between 0.49 and 0.87 which is comparable to other translation of the instrument [20].

The Arabic translated ASQ was then administered to 879 parents who consented to participate between 2009 and 2011; after excluding 146 because of age discrepancy, data on 733 healthy infants aged 4 to 36 months were available for analysis. Children were considered

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