

Parental knowledge of children's developmental milestones in Aseer, Saudi Arabia

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ABSTRACT

Background: Better parental knowledge about developmental milestones of children is linked to better parent-child interaction. Only a handful of surveys have been conducted to evaluate parental knowledge of developmental milestones in Arabic-speaking countries. **Materials and Methods:** The study is a cross-sectional, questionnaire-based observational investigation using a simple random sampling scheme. The sampling frame consisted of all parents attending the family medicine services during the period of conduct of the study. Poisson regression modelling techniques were used to analyse the adjusted effect of sociodemographic factors on knowledge score. **Results:** Three hundred and seventy-five parents agreed to be included in the study. Only 29 (7.7%) had an excellent knowledge level. Poor knowledge was found among 141 (37.6%) participants. Also, 180 (48%) participants were found to have an acceptable level of knowledge. Mothers achieved acceptable knowledge of developmental milestones better than fathers, and better knowledge was found in less-crowded houses. Physical developmental milestones were known by 304 (81.1%) participants, followed by cognitive development milestones ($n = 78$, 20.8%), social development milestones ($n = 47$, 12.5%) and emotional development milestones ($n = 85$, 22.7%). The internet was the most used source ($n = 83$, 22.1%). The most avoided sources were educational workshops ($n = 230$, 61.3%), followed by doctors ($n = 159$, 42.4%) and social media ($n = 130$, 34.7%). **Conclusions:** We confirmed in this work that parental knowledge of children's developmental milestones is suboptimum among Saudi parents. Use of the internet and avoidance of healthcare professionals is a source of concern. Care is required for children coming from overcrowded homes in terms of their developmental progress. Focus should be on educating parents about the social and emotional developmental milestones.

Keywords: Developmental Milestones, parental knowledge, risk factors, southeastern Saudi Arabia

Introduction

Undoubtedly, productivity of society depends heavily on the early life experience of children, particularly the one related to the under-five psychological and physical development.^[1] It is well known that parents' knowledge constitutes the frame of reference for how parents interpret and appraise the behaviours of their children. It gauges their expectations and how they interact with their developing child. Hence, parents' knowledge

is of crucial importance for the children's physical, cognitive and emotional development.^[2]

Parental knowledge of their children's development was shown to positively influence their parenting competence and skills.^[3,4]

It is also well known that parenting style vis-à-vis follows the knowledge parents have about the developmental milestones of their children. Maternal knowledge of child development has been shown to influence how mothers raise their children and the environments they provide.^[5]

Moreover, neurocognitive development depends largely on the acquisition of fine and gross motor skills by the children

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in their first 3 years of life.^[6] Furthermore, disturbances in neurodevelopment of children cause a variety of neuromuscular dysfunctions.^[7] Normal development relies on a complex array of genetic, social, environmental and dietary factors.^[8]

Indeed, suitable environment for healthy development of children requires parents to be knowledgeable of how and when developmental milestones are achieved.^[9,10] Better knowledge about developmental milestones is linked to better parent–clinician interaction and higher levels of parental competence and self-esteem.^[11]

Only a few surveys have been conducted to evaluate parental knowledge of developmental milestones in Arabic-speaking countries.^[12,13] Family physician frequently assesses developmental milestones in paediatric patients in order to evaluate their physical and psychological well-being. Substantial time could be spent discussing attainment of milestones with parents in primary healthcare settings. Very few studies in Saudi Arabia have been devoted to assessment of knowledge of parents about the developmental milestones in children. One recent orphan study confirmed extremely poor knowledge among Saudi parents with regards to children's development, particularly cognitive and emotional development.^[1]

The main objective of the current study was to extend the methodology covered by Aldayel *et al.*^[1] to include parents from Aseer region in Saudi Arabia. We attempted to assess the knowledge of parents in the southeastern province of Saudi Arabia about children's developmental milestones. We also attempted to explore what knowledge sources are used by parents regarding children's developmental milestones, particularly healthcare professionals. We hope that our results would provide reliable guidance for designing effective health education programmes that would improve knowledge of parents in Saudi Arabia in terms of children's developmental milestones.

Parental knowledge about children's developmental milestones is crucial in terms of parent–child interaction, child development and parental self-efficacy and satisfaction. Such knowledge levels are seldom explored in Saudi Arabia.

We found a single survey^[1] in the capital Riyadh that explored a fairly large sample of nearly 1500 parents' views about children's development. The recruited parents were residents of Riyadh and had a minimum of one offspring. Four in five parents demonstrated poor level of knowledge across all four developmental domains (physical- 48%, social- 79%, cognitive- 78% and emotional development- 79%). Reliance by parents on healthcare professionals for knowledge about milestones' timings was quite less (only one in 20).

A recent Jordanian study explored ($N = 400$) Jordanian mothers' knowledge of infants' developmental milestones. Safadi *et al.*^[2] conducted a cross-sectional survey using an Arabic version of MacPhee's 'Knowledge of Infant Development Inventory'.

They found that mothers were more familiar with physical developmental milestones. However, there was substantial lack of knowledge about cognitive and emotional developmental milestones among the participating mothers in Jordan. None of the background sociodemographic variables had an impact in terms of knowledge about developmental milestones. These results confirmed the past findings that mothers prefer traditional informal practices to better structured parenting programmes. Clearly, there was an urgency for healthcare policymakers to design educational packages targeting parents in terms of physical, cognitive, emotional and parent–infant interaction domains in childrearing.

One recent Qatari study^[13] that attempted to estimate knowledge of mothers about child development determined the level of maternal knowledge of child development. It included over 260 mothers. It used two psychometric tools, namely, the Knowledge of Infant Development Inventory and the Catalogue of Previous Experience with Infants. The overall knowledge levels were disappointingly low among mothers in Qatar.

A more recent study in the subject of evaluation of parental knowledge about children's developmental milestones was conducted in Iraq.^[12] It used the psychometric tool known as "developmental checklists birth to five" to encompass the four big developmental domains (motor, cognitive, language and social domains). The study evaluated a large sample of 400 Iraqi mothers who happened to attend primary healthcare centres in Baghdad. Knowledge about motor development was good in 19% of the sampled mothers. Only 18.5% showed good knowledge about cognitive milestones. Only 5.5% reported having a good knowledge about linguistic milestones, and 7% showed good knowledge about social developmental milestones.

Iranian researchers conducted a qualitative study of 24 Tehran-based parents of small children using purposive sampling method.^[14] They used eight sessions for collection of qualitative data (namely, four focus group discussions and four individual interviews). They confirmed the poor status of Iranian parental knowledge about developmental milestones of early childhood. Despite the finding that their knowledge on physical and linguistic development was fair, their knowledge about social and cognitive development was particularly limited. Knowledge resources were humans (particularly paediatricians), physical, virtual space and media resources.

In 2005, Stephanie Riech examined knowledge of over 400 American mothers about developmental milestones of their children. The knowledge score was averaged at 65%, with particularly poor knowledge about sleep patterns and milestones at the 6-month point. However, the author noted better knowledge levels with better education and higher kids' count.^[5]

Later, a Canadian study^[11] explored the level of knowledge of developmental milestones among 1443 adults. Physical milestones' questions were passed by 63%, cognitive milestones'

questions by 15% and social milestones' questions by only 7% of respondents. Only 2% passed the questions about emotional development. It was notable that females were more knowledgeable than males and parents were much better in terms of knowledge than non-parents. The link between school performance and early first year development was noted by four out of every five respondents.

Primary objective

Our primary objective was to assess the knowledge of parents in the southeastern province of Saudi Arabia about children's developmental milestones.

Secondary objectives

1. To estimate the level of parental knowledge in Aseer region about children's physical developmental milestones
2. To estimate the level of parental knowledge in Aseer region about children's social developmental milestones
3. To estimate the level of parental knowledge in Aseer region about children's emotional developmental milestones
4. To estimate the level of parental knowledge in Aseer region about children's cognitive developmental milestones
5. To estimate the frequencies of different categories of sources of information contributing to parental knowledge in Aseer region about children's physical developmental milestones
6. To estimate the impact of sociodemographic factors on the level of parental knowledge in Aseer region about children's physical developmental milestones.

Materials and Methods

The study is a cross-sectional, questionnaire-based observational investigation.

The study population consisted of all parents with at least one child under 14 years of age attending a family health clinic in Aseer region.

Inclusion criteria

1. Adult parent (over 18 years of age)
2. Having one living child of age under 14 years
3. Attending a family medicine clinic
4. Resident of Aseer province
5. Literate with sound cognitive abilities.

Exclusion criteria

1. Parent (below the age of 18)
2. Patients with severe cognitive impairment such as dementia or delirium
3. Patients unwilling to give written consent to participate.

Study area: The province of Aseer in Saudi Arabia.

Sample size: Based on the 80% level of poor knowledge for parents about children's developmental milestones, reported by

Aldayel *et al.*,^[1] 5% significance, 3% error margin and 80% power, we require at least $N = 683$ participants.

Sampling technique: A simple random sampling scheme was adopted when choosing participants for the current study. The sampling frame was constructed using data of all parents attending the family medicine services during the period of study conduct. Random tables were used to identify whether a particular parent would be included in the study. All included parents were approached by a member of the research team and invited to participate.

Data collection tool: The tool used by Aldayel *et al.*^[1] was adopted with permission for the current study. The tool used was a self-rating, 17-item questionnaire that encompassed four domains of parental knowledge about children's developmental milestones: a four-item physical development subscale (composed of walking, crawling, grasping and self-dressing), a three-item cognitive development subscale (imagination, responding to instructions and counting), a five-item social development subscale (playing with peers, sharing toys, playing by self, having a best friend and cooperating with others) and a five-item emotional development subscale (having a choice, reading facial expressions, developing different tones of crying, linking with parents and becoming aware of justice and crime concepts). All sub-scores were summed up to give a 17-item total score. Additionally, seven questions assessed what sources of information were used by parents to obtain knowledge on developmental milestones. Parental knowledge scores were further divided into 'excellent' ($\geq 75\%$), 'good' (50%–75%), 'fair' (40%–50%) and 'poor' ($\leq 39\%$) and were considered 'acceptable' if the score was $\geq 50\%$ for each knowledge domain.

Data collection technique: Parents were interviewed by the principal researcher. The study purpose was explained in simple plain Arabic, and they were given ample opportunities to ask questions about the study. They were provided with pen and papers along with the study tool to measure parental knowledge of children's milestones and the associated sociodemographic factors.

Data entry and analysis: Data were entered into an Excel document as they were collected. The document was saved in the personal computer device of the principal researcher. It was password protected. We used R statistical software to run Poisson generalised linear modelling for the data set.

Pilot study/pretesting: The first 10 parents' data were examined for any technical difficulties. The understanding of parents about the research tools' items was examined. Any corrections needed in the final version of the questionnaires were carried out based on the pilot results.

Ethical consideration: Full ethical approval was sought from and granted by the regional research and ethics committee.

Budget: The study was self-funded by the principal researcher.

Data analysis was performed using the R Statistical package version 3.6.0. Descriptive statics such as frequencies and proportions were used to describe categorical data (for instance, gender of parent and type of residence). Measures of location, such as mean, and measures of central tendency, such as standard deviation, were used to describe numerical continuous data (for instance, age and count of cohabitants). Non-parametric statistical tests such as Chi-squared test were used to compare dependence of categorical data, such as association between gender and acceptable knowledge level. Parametric tests such as *t*-test were used to analyse associations between continuous and categorical data, for example, effect of age on knowledge level acceptability. Generalised linear Poisson regression modelling techniques were used to analyse the adjusted effect of sociodemographic factors on knowledge score. The tests were all two-sided, and the significance threshold was set at $P < 0.05$ with Bonferroni correction where applicable.

Results

The total number of parents who were approached for participation in the study was 377, of whom 375 agreed to be included in the study and gave consent to participate. The response rate was, therefore, 99.5%.

For a detailed account of demographic results, see Table 1.

Among those who agreed to participate, there were 67 (17.9%) fathers and 308 (82.1%) mothers.

As per Table 2, only 29 (7.7%) participants showed excellent knowledge level. There were 151 (40.3%) participants with a good level of knowledge and 54 (14.4%) with a fair level of knowledge. On the other hand, 141 (37.6%) participants had a poor knowledge level.

There were 195 (52%) parents whose score was under 50% and were deemed of having unacceptable level of knowledge about developmental milestones. There were, however, 180 (48%) parents who scored over 50% and were deemed of having an acceptable level of knowledge about developmental milestones. In terms of the unadjusted effect for background sociodemographic variables on the acceptability of knowledge level, mothers were far more likely to achieve acceptable knowledge of developmental milestones than fathers (51.9% vs. 29.9%, $P = 0.0017$). Also, the less crowded a house is, the more acceptable the levels of knowledge achieved on developmental milestones were (mean number of persons in the acceptable category was 5.3 in contrast to 6.1 in the unacceptable category, $P = 0.0002$). See Table 3 for a comprehensive account of the unadjusted impact of background sociodemographic factors on knowledge level among the participating parents. Figure 1 shows the adjusted effect of background sociodemographic factors on knowledge level among the participating parents.

Table 1: Baseline demographics of the study participants

Factor	Count (n)/mean	Percentage/SD
Age	37.0 years	9.4 years
Gender		
Male	67	17.9%
Female	308	82.1%
Nationality		
Saudi	385	95.5%
Yemeni	17	4.5%
Residence		
Abha	299	79.7%
Khamis	47	12.5%
Other	29	7.8%
Number of cohabitants	5.7 persons	2.21 persons
Education		
Bachelor	247	65.9%
Diploma	39	10.4%
Post-graduate	17	4.5%
Secondary or less	69	18.4%
Occupation		
Employee	168	44.8%
Retired	26	6.9%
Students	38	10.1%
Unemployed	143	38.1%
Family income		
High	24	6.4%
Low	28	7.5%
Medium	323	86.1%
Marital status		
Divorced	17	4.5%
Married	344	91.7%
Widowed	14	3.7%
Moved house last year		
Yes	74	19.7%
No	301	80.3%
Moved house in 5 years		
0	174	46.4%
1	151	40.3%
2	32	8.5%
3	18	4.8%
Age during birth of the first child	25.4 years	4.46 years
Children under 14	2.2 children	1.18 children
Age of the eldest child, years		
Up to 3	57	15.2%
4-6	50	13.3%
6-12	76	20.3%
12-16	54	14.4%
17-19	39	10.4%
Over 20	99	26.4%
Sex of the eldest child		
Male	224	59.7%
Female	151	40.3%
Children with special needs		
Yes	17	4.5%
No	358	95.5%

SD=standard deviation

Only the number of cohabitants and secondary education were associated with reduction in total knowledge score when all factors were adjusted in terms of their simultaneous effect [Table 4]. One extra cohabitant is associated with 2.9% reduction in the odds of total knowledge score (odds = 0.971, $P = 0.0389$), and secondary education (compared to

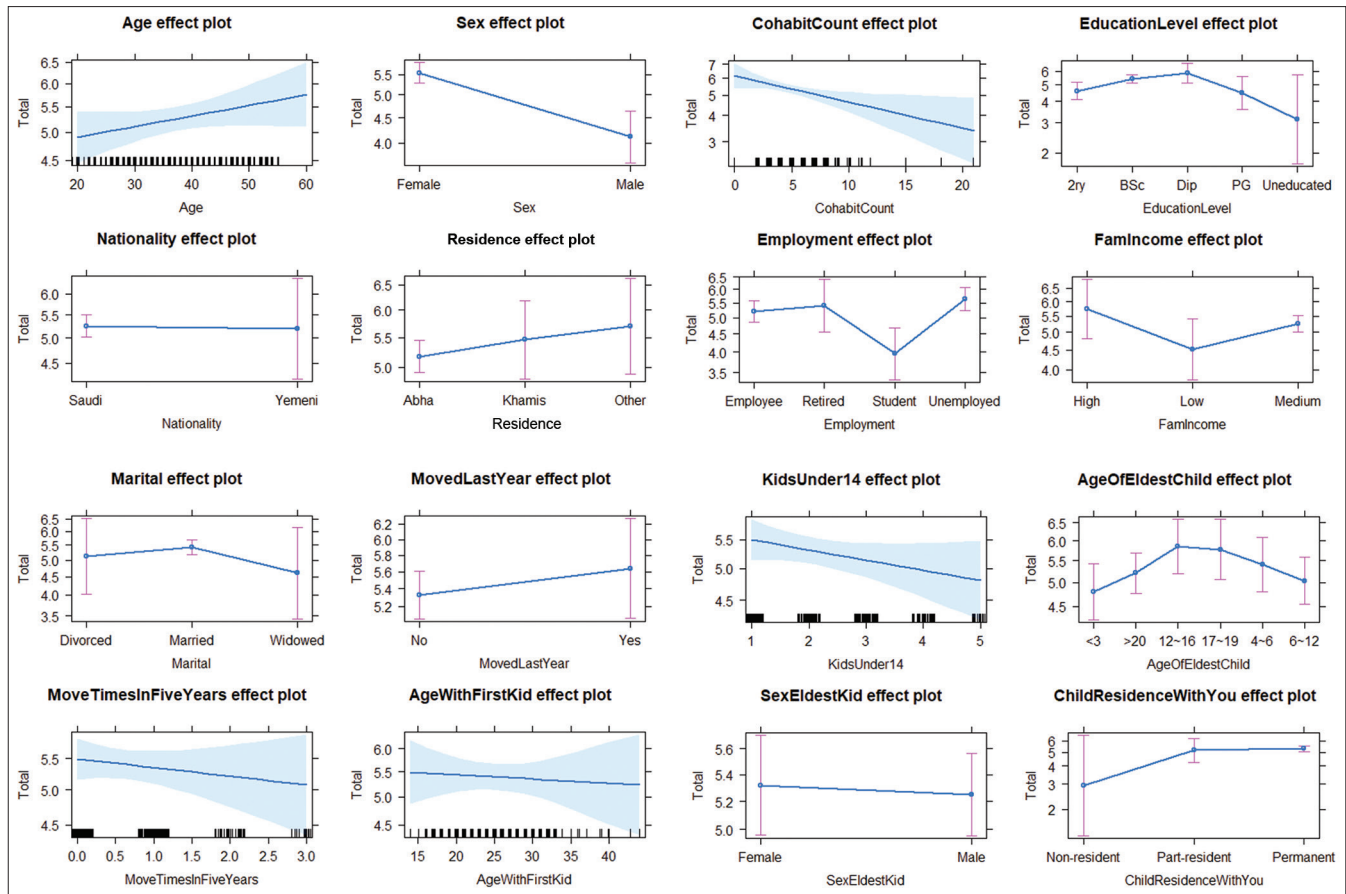


Figure 1: Estimates for the effects of clinical and demographic factors on overall parental knowledge of milestones

Table 2: Description of the knowledge level about developmental milestones among the study participants		
Knowledge level	Count	Percentage
Excellent	29	7.7
Good	151	40.3
Fair	54	14.4
Poor	141	37.6

university education) means 15.6% reduction in the total score (odds = 0.844, $P = 0.0244$).

Table 5 gives a comprehensive display of the participants' responses to individual developmental milestones.

There was high level of knowledge among the participating parents about physical developmental milestones, as 304 (81.1%) scored more than half the total score. However, the corresponding proportion for parents in terms of cognitive development was 78 (20.8%), and social development ($n = 47$, 12.5%) and emotional development ($n = 85$, 22.7%) were far less impressive. Clearly, parents were far less acquainted with emotional developmental milestones than social developmental milestones. For instance, only 49 (13.1%) parents realised that a 4–6-month-old baby has different pitches of cries and only 61 (16.3%) realised that a 4–6-month-old baby can emotionally

bond with his/her caregiver. This is to be compared with marginally better knowledge of social developmental milestones, as 77 (81%) participants realised that a 5–6-year-old child could show empathy and 84 (22.4%) participants correctly knew that 5–6 year olds could have best friends. Physical developmental milestones were best known among the participating parents. Around 280 (74.7%) correctly responded that a 12–18-month-old toddler could walk, and further, 276 (73.6%) knew that a 6–12-month-old toddler could start crawling. Table 5 displays the exact percentage of correct responses to knowledge questions.

As shown in Table 6, the internet was always the most used source ($n = 83$, 22.1%), whereas relatives and friends and television were used sometimes by the majority of participants ($n = 175$, 46.7% and $n = 163$, 43.5%, respectively). The most avoided sources of information about paediatric developmental milestones among the participants were educational workshops ($n = 230$, 61.3%), followed by doctors ($n = 159$, 42.4%) and social media ($n = 130$, 34.7%).

Discussion of key findings

This investigation surveyed a large number of parents, that is, 375 participants, in order to estimate the current level on knowledge about children's developmental milestones among Saudi parents residing in the southeastern region of Saudi

Table 3: Unadjusted impact of sociodemographic variables on acceptability of knowledge level among the study participants

Factor	Level of knowledge		Chi-squared/t	P
	Acceptable	Unacceptable		
Age	m=37.4 years	m=36.5 years	$t_{(373)}=0.9221$	0.03571
Gender				
Male	20 (29.9%)	47 (70.1%)	$\chi^2_{(1)}=9.8982$	0.0017
Female	160 (51.9%)	148 (48.1%)		
Nationality				
Saudi	172 (44.7%)	186 (48.3%)	$\chi^2_{(1)}=0$	1
Yemeni	8 (47.1%)	9 (52.9%)		
Residence				
Abha	142 (47.5%)	157 (52.5%)	$\chi^2_{(2)}=0.2086$	0.901
Khamis	23 (48.9%)	24 (51.1%)		
Other	15 (51.7%)	14 (48.3%)		
Number of cohabitants	m=5.3 persons	m=6.1 persons	$t_{(340)}=0.37927$	0.0002
Education				
Bachelor	124 (50.2%)	123 (49.8%)	$\chi^2_{(4)}=6.7659$	0.1488
Diploma	23 (59%)	16 (41%)		
Post-graduate	7 (41.2%)	10 (58.8%)		
Secondary or less	26 (37.7%)	46 (66.3%)		
Occupation				
Employee	81/168 (48.2%)	87/168 (51.8%)	$\chi^2_{(3)}=9.1552$	0.0273
Retired	12/26 (46.2%)	14/26 (53.8%)		
Students	10/38 (26.3%)	28/38 (73.7%)		
Unemployed	77/143 (53.8%)	66/143 (46.2%)		
Family income				
High	11 (45.8%)	13 (54.2%)	$\chi^2_{(2)}=3.171$	0.2048
Low	9 (32.1%)	19 (67.9%)		
Medium	160 (49.5%)	163 (50.5%)		
Marital status				
Divorced	5 (29.4%)	12 (70.6%)	$\chi^2_{(2)}=4.8732$	0.0875
Married	171 (49.7%)	173 (50.3%)		
Widowed	4 (28.6%)	10 (71.4%)		
Moved house last year				
Yes	40 (54.1%)	34 (45.9%)	$\chi^2_{(1)}=1.0685$	0.3013
No	140 (46.5%)	161 (53.5%)		
Moved house in 5 years				
0	85/174 (48.9%)	89/174 (51.1%)	$\chi^2_{(3)}=3.5572$	0.3134
1	77/151 (51%)	74/151 (49%)		
2	12/32 (37.5%)	20/32 (62.5%)		
3	6/18 (33.3%)	12/18 (66.7%)		
Age during birth of the first child	m=25.2 years	m=25.5 years	$t_{(350)}=0.6611$	0.509
Children under 14	m=2.1 children	m=2.3 children	$t_{(370)}=1.1395$	0.2552
Age of the eldest child, years				
Up to 3	28 (49.1%)	29 (50.9%)	$\chi^2_{(5)}=6.0006$	0.3062
4-6	24 (48%)	26 (52%)		
6-12	31 (40.8%)	45 (59.2%)		
12-16	33 (61.1%)	21 (38.9%)		
17-19	20 (51.3%)	19 (48.7%)		
Over 20	44 (44.4%)	55 (55.6%)		
Sex of the eldest child				
Male	111/224 (49.6%)	113/224 (50.4%)	$\chi^2_{(1)}=0.3945$	0.53
Female	69/151 (45.7%)	82/151 (54.3%)		
Children with special needs				
Yes	6/17 (35.3%)	11/17 (64.7%)	$\chi^2_{(1)}=0.6803$	0.4095
No	174/358 (48.6%)	184/358 (51.4%)		
Living with you				
Non-resident	0 (0%)	2 (100%)	$\chi^2_{(2)}=2.7767$	0.2495
Part resident	8 (38.1%)	13 (61.9%)		
Permanently	172 (68.3%)	180 (71.4%)		

Arabia. The response rate was impressive (over 99%). Mothers constituted four-fifths of our participants. This is likely because

majority of the children in Saudi Arabia attending family medicine facilities would be accompanied by their mothers rather than their fathers. In fact, over 60% of paediatric visits involved mothers accompanying children rather than fathers (who accompanied children in 12% of their visits). This was most likely due to conflicting work schedules.^[15,16] This could explain our finding that mothers tend to be more knowledgeable about paediatric developmental milestones than fathers. Mothers in our sample were found to be more knowledgeable than fathers (51.9% of mothers' knowledge was acceptable compared to 29.9% of fathers). Since mothers accompany their children more frequently to clinics, they are in contact with health professionals far more than fathers. Therefore, one would assume their knowledge about clinical issues, including developmental milestones' timings, should be more accurate than that of fathers. However, further research needs to explore such assumptions.

Our findings indicated that almost over a third (37.6%) of all participating parents had a poor level of knowledge about the various developmental milestones, with over a half (52%) showing a knowledge level that was deemed unacceptable as they scored less than half of total knowledge points. A small proportion of the participants (7.7%) achieved excellent knowledge about child developmental milestones. These disappointing results mirror the findings by surveys conducted in Arabic-speaking samples.^[2,13] In the investigation carried out by Aldayel *et al.*,^[1] they found four-fifths of the participants to have a poor level of knowledge about developmental milestones. That figure is slightly worse than our figure for poor knowledge of one in two participants. One possible explanation is that their female proportion was only 65% of all the participants, compared to the proportion of mothers in our study (82%), and females have better inherent knowledge levels than men. Furthermore, 75% of their participants were university graduates compared to

Table 4: Adjusted impact of sociodemographic variables on the total score of knowledge level among the study participants

	Odds	95% CI	P
Age	1.0037	0.9940-1.0135	0.45202
Sex: male	0.8492	0.7205-1.0010	0.05136
Nationality: Yemeni	1.1001	0.8607-1.4059	0.44614
Residence: Khamis	1.0210	0.8855-1.1773	0.77472
Residence: other	1.0779	0.9071-1.2808	0.39401
Cohabitant count	0.9714	0.9450-0.9985	0.03885*
Education: diploma	1.0401	0.8958-1.2076	0.60599
Education: post-graduate	0.8228	0.6524-1.0378	0.09957
Education: up to secondary	0.8442	0.7284-0.9784	0.02440*
Education: uneducated	0.5815	0.3146-1.0748	0.08365
Employment: retired	1.0288	0.8438-1.2544	0.77867
Employment: student	0.9007	0.7004-1.1583	0.41520
Employment: unemployed	1.0919	0.9717-1.2269	0.13964
Family income: low	0.8411	0.6314-1.1204	0.23685
Family income: medium	0.9658	0.7913-1.1788	0.73214
Marital status: married	0.8600	0.6548-1.1294	0.27804
Marital status: widowed	0.7576	0.5096-1.1263	0.17000
Moved house last year	1.0605	0.9349-1.2030	0.36093
Moved house in the last 5 years	0.9569	0.8944-1.0238	0.20161
Age during birth of the first child	0.9981	0.9858-1.0105	0.76059
Kids under-14	0.9981	0.9514-1.0470	0.93647
Age of the eldest child: 17-19	1.0802	0.8972-1.3007	0.41529
Age of the eldest child: 4-6	0.9994	0.8162-1.2236	0.99510
Age of the eldest child: 6-12	0.8734	0.7410-1.0296	0.10688
Age of the eldest child: over 20	0.9505	0.7944-1.1372	0.57885
Age of the eldest child: up to 3	0.9939	0.8006-1.2338	0.95569
Sex of the eldest kid: male	1.0104	0.9184-1.1115	0.83197
Child's residence with you: part resident	2.0701	0.6279-6.8252	0.23194
Child's residence with you: permanent	2.0175	0.6164-6.6031	0.24596

CI=confidence interval

Table 5: Frequency of correct responses to items in each developmental milestone category

Developmental milestone category (count of correct responses, %)	Developmental milestone item	Correct answer	Count of correct responses (%)
Physical development (n=304, 81.1%)	Walk	12-18 months	280 (74.7%)
	Crawl	6-12 months	276 (73.6%)
	Reach for objects	4-6 months	256 (68.3%)
	Dress themselves	2-3 years	107 (28.5%)
Cognitive development (n=78, 20.8%)	Engage in fantasy play	12-18 months	78 (20.8%)
	Follow simple instructions	12-18 months	108 (28.8%)
	Begin counting	2-3 years	134 (35.7%)
Social development (n=47, 12.5%)	Parallel play	18-24 months	63 (16.8%)
	Share toys	3-5 years	99 (26.4%)
	Play alone for an hour	3-5 years	99 (26.4%)
	Have best friend	5-6 years	84 (22.4%)
	Show empathy	5-6 years	77 (20.5%)
Emotional development (n=85, 22.7%)	Exert independence	12-18 months	81 (21.6%)
	Recognise others' emotions	6-12 months	75 (20%)
	Different pitches of cries	4-6 months	49 (13.1%)
	Bond with caregiver	4-6 months	61 (16.3%)
	Advocate for fairness	5-6 years	58 (15.5%)

Table 6: Frequency of each information source used by parents to acquire knowledge about developmental milestones of children

Source	Always (%)	Sometimes (%)	Rarely (%)	Never (%)
Doctor	12 (3.2%)	141 (37.6%)	63 (16.8%)	159 (42.4%)
Relatives and friends	54 (14.4%)	175 (46.7%)	53 (14.1%)	93 (24.8%)
Journals and magazines	40 (10.7%)	147 (39.2%)	78 (20.8%)	110 (29.3%)
Internet	83 (22.1%)	156 (41.6%)	47 (12.5%)	89 (23.7%)
Social media	17 (4.5%)	127 (33.9%)	101 (26.9%)	130 (34.7%)
Educational workshops	25 (6.7%)	66 (17.6%)	54 (14.4%)	230 (61.3%)
Television	23 (6.1%)	163 (43.5%)	87 (23.2%)	102 (27.2%)

80% of our participants. However, it is difficult to explain such a difference with a degree of high certainty.

Also, the less crowded a house was, the more acceptable levels of knowledge on developmental milestones were achieved (mean number of persons in the acceptable category was 5.3 in contrast to 6.1 in the unacceptable category). Number of people living in a house was not found to impact parents' knowledge among the residents of Riyadh.^[1] This, pending further focused research, may constitute a key difference between metropolitan and rural communities. Although the percentages of families with under-six and over-six people at home were comparable between their study and our study, the distribution of our participants' cohabiting people was not even. We had families with as many as 21 people living under the same roof. Crowding and neighbourhood quality were long regarded as essential elements in child development.^[17] Paediatric research has long confirmed the association between quality of housing and child's physical and psychological well-being.^[18] However, the relationship between housing and parental knowledge about child's health and development did not receive much attention. The effect of an overcrowded house on a child's cognitive and social development can invalidate parents' knowledge about developmental milestones if the child's growth is not conforming with typical timings of developmental events.^[19] This is an assertion that must be explored in large-scale studies, particularly in Arabic-speaking countries.

Parents who were schooled till secondary education were found to be less knowledgeable about developmental milestones (compared to those with university education) with 15.6% reduction in total score odds, even after adjusting for age with first child, parent gender, and residence. Education level among parents was found by a chain of studies to be indicative of socioeconomic class.^[20] Of course, the more educated a parent is, the easier they can access accurate information about children's development. Research has shown that among all relevant sociodemographic factors, parental educational level has the strongest influence on a child's development.^[21] However, it remains difficult to tell the exact cause for the effect of parental education on parental knowledge of developmental milestones.

We found a high level of knowledge about the physical developmental milestones among the participating parents, as 304 (81.1%) scored more than half the total score. This clearly exceeded the score for cognitive development knowledge ($n = 78$, 20.8%), social development knowledge ($n = 47$, 12.5%) and emotional development knowledge ($n = 85$, 22.7%). This replicates the findings of Aldayel *et al.*^[1] This is a source of concern, as it seems that parents focus primarily on the physical development of their children at the expense of social and cognitive development. Focus on motor development was reported even in developed countries.^[11] Missing early signs of neurodevelopmental disorders that manifest as regress and delay in social and emotional milestones can be a direct consequence of poor knowledge about non-physical milestones among parents.

Worryingly, 22.1% of our participating parents always used the internet to gain knowledge about the developmental milestones. It is well documented that internet-based information in paediatric websites is not consistent with scientific or research-based information.^[22] We should carry out surveys related to the accuracy of information about the developmental milestones that is offered in Arabic websites. This is because over one in five among the participating parents in the current investigation revert to the internet for information, given its easy accessibility and cheap cost. Some of the official websites (such as the World Health Organisation [WHO] and medical journals) could be accurate sources of information;^[23] however, they may not be so popular among Saudi parents and their Arabic language content may not be up to date. Many recent studies sought to evaluate the effect of well-designed websites on knowledge about childhood development.^[24] We could see a trend of such online educational interventions in the coming years, and we should follow suit in our Arabic-speaking area of the world. Over 61% of our recruited parents avoided using formal workshops and, in a concerning finding, 42.4% avoided doctors as source of information. This is slightly better than the 5% figure reported by Aldayel *et al.*^[1] in terms of those who rely on physicians as a source of information about child development. It is difficult to ascertain why parents did not prefer to get information from healthcare professionals. Some may not regard development as a medical issue in the first place. Others may not have adequate access to doctors and clinicians due to their busy schedule. Again, research into this area should be prioritised.

Innovation in providing information to parents regarding developmental milestones is of crucial importance for practicing family physicians. Many practices opted for digitalisation of their routine health education with promising results.^[25,26]

To sum up, parental knowledge of children's developmental milestones in Saudi Arabia is suboptimum. It is concerning to note that parents use internet as a source of knowledge and tend to avoid healthcare professionals.

A key message that emerges from our current investigation is that attention is required by family physicians and public health

policymakers towards the health education of parents and the need to make it accessible by creative use of digital and online resources widely available in Saudi Arabia. One unique and novel finding from our results compared to the results published within the last 2 years is the improvement in acceptance of health information from health professionals by parents. Indeed, capitalising on such acceptance should be prioritised.

We note many strengths of the current survey. We included an exceptionally large data set that included information from over 375 parents. The response rate was quite impressive.

One significant limitation of the current research is the cross-sectional design that gives only a snapshot of the levels of knowledge about developmental milestones among parents, but it could not ascertain the causation relationship between clinical and sociodemographic factors and the knowledge level.

Future research should attempt to investigate the effectiveness of targeted educational interventions that could improve knowledge about child developmental milestones, particularly non-physical indicators, among parents and parents-to-be. One of the recently proposed educational programmes is the so-called 'Learn the Signs. Act Early'. (LTSAE) educational materials^[27] that can be translated into Arabic language and delivered to Saudi parents. Also, parental gender difference in terms of accompanying children to routine and emergency clinics requires focused research. Furthermore, research should evaluate how crowding and large number of cohabitants affect parental knowledge about different categories of developmental milestones. It is also important to survey the Arabic language websites about accuracy of their information regarding child developmental milestones. The governments should also consider launching their own accurate, attractive and well-written information websites about child developmental milestones.

Recommendations

1. Knowledge about developmental milestones remains suboptimum among Saudi parents. Family physicians should empower parents with essential knowledge of developmental milestones using creative, innovative and engaging techniques.
2. Future research should attempt to explore the inter-relationship between overcrowding and poor knowledge about children's developmental milestones.
3. Care is required for children coming from overcrowded homes in terms of their developmental progress.
4. Efforts should be made to improve housing quality, as it strongly influences parental knowledge of children's developmental milestones.
5. Focus should be on educating parents about the social and emotional developmental milestones, such that children with neurodevelopmental disorders can be identified early and effective interventions can be delivered timely.
6. Given the popularity of the internet as a source of information for Saudi parents, the public health governing

bodies should launch their own accurate and attractive well-written information websites about child developmental milestones.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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