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SAUDI ADULT'S KNOWLEDGE OF PEDIATRIC DEVELOPMENTAL MILESTONES

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Abstract:
Observing and recognizing early developmental milestones for potential delays or concerns is crucial for timely and appropriate interventions. Many studies have been conducted in Saudi Arabia to evaluate parental knowledge of developmental milestones, but none have investigated the general population's knowledge of developmental milestones. We aimed to assess the awareness and knowledge levels of the adult population in the Kingdom of Saudi Arabia regarding developmental milestones. This cross-sectional study was conducted between July and December 2024, using a structured questionnaire to evaluate adult's knowledge of developmental milestones. We found a strong recognition of gross motor skills in older children, but significant uncertainty regarding infant milestones. There was a decline in the knowledge of speech/language development of older children. Most participants identified key developmental traits for older children, and many relied on informal sources, such as family and friends, for information. Collectively, 31% of the participants demonstrated a high level of knowledge. We revealed significant gaps in awareness and knowledge of developmental milestones among the adult population in Saudi Arabia. Given the importance of early recognition of developmental delays for timely intervention, there is a clear need for targeted educational initiatives to enhance awareness and understanding of developmental milestones among adults.

Keywords: Saudi Arabia; developmental milestones; pediatric age; knowledge

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Introduction

Developmental milestones refer to age-appropriate abilities and activities that most children achieve on time [1]. Children are evaluated for delayed development in five core domains: fine motor, gross motor, social/emotional, and speech/language [2]. Interventions within the first 5 years of life are regarded as one of the most beneficial components in preventing illness and improving health, due to advances in motor and psychological development [3]. In well-established nations, over 200 million children struggle to achieve their full developmental potential [4]. Approximately 7.1% of children worldwide have an estimated developmental delay, with the 0–12-month age group exhibiting the greatest delay. This demonstrates the significant rate of developmental delay and the importance of careful monitoring in children aged 0–12 months of age [5].

Numerous studies have been conducted in Saudi Arabia to evaluate parental awareness of developmental milestones. However, no studies have been conducted to determine what the general adult population knows about developmental milestones. According to data from a Saudi Arabian survey on parental knowledge of developmental milestones in the Aseer Province, 195 parents (52%) had inadequate knowledge of developmental milestones, with scores below 50%. However, 180 parents (48%) received a score of more than 50% and were considered to have sufficient understanding of developmental milestones [6]. A recent study conducted in Al-Kharj City, Saudi Arabia, demonstrated that out of a sample of 406 parents, 68% of respondents correctly answered the motor development milestones question, whereas 32% answered the question erroneously. The overall percentage of accurate responses in speech/language development was 60% compared to 40% for erroneous answers: 50% of the surveyed participants were unaware of the appropriate age for children to be fully toilet-trained and the age at which they typically learn to wave goodbye [7]. Another study that surveyed 372 respondents in Al-Ahsa, Saudi Arabia, revealed that parents had a limited understanding of their children's developmental milestones, particularly in the emotional, cognitive, and social/emotional domains [8].

Developmental milestone monitoring is essential for child health as it is a predictable stage in infant and child development. Hence, developmental milestones are an invaluable tool that clinicians use to facilitate early intervention when a developmental delay or red flag is noted [9]. Furthermore, knowledgeable parents scored higher in parenting skills, as they were more capable of structuring nurturing children’s learning environments to ensure positive parent-child interactions and development. This also enhances the perceptions of competence, investment in parenting, satisfaction, and the development of more realistic expectations for the child, ensuring an accurate interpretation of the child’s behavior [10]. In contrast, parents who demonstrated lower levels of knowledge about their children’s developmental milestones were more abusive and neglectful of their children. Moreover, they showed signs of frustration with the discrepancy between their child’s expectations and the current state of their development [11].

Parents who have more knowledge of children’s developmental milestones, cognitive growth, and speech/language development from the first week of their infant’s life are more likely to provide mental stimulation and speech/language input throughout the first year of their infant’s life. Thus, they play a significant role in shaping children’s developmental trajectories. Caregiving sensitivity that fosters

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social/emotional and cognitive growth is a predictor of a child's mental abilities, speech/language skills, and social and emotional outcomes [12].
There are limitations to the previous studies in Saudi Arabia, the Gulf, and the broader Middle East, such as small sample sizes, a focus on parents, or a concentration on middle-to high-income families. Given the magnitude of this topic and the lack of sufficient knowledge within the Saudi population, this study seeks to address these gaps. We aimed to evaluate the awareness and knowledge of pediatric developmental milestones among the general adult population in Saudi Arabia, providing a more comprehensive understanding of knowledge levels across diverse demographic groups.

Materials and method

Design and setting

This cross-sectional questionnaire-based study was conducted between July 2024 and December 2024 in Saudi Arabia. The target population included Saudi adults aged 18 to 65 years. Sample size calculations were conducted to determine the minimum number of participants required to accurately represent the population. A Raosoft Sample Size Calculator was used to calculate the sample size [13]. The initial sample size was 385 participants; however, we finally enrolled 924 participants.
We included adult Saudi residents aged 18 years and above from all provinces who were willing to participate in the study by agreeing to provide informed consent, and all demographic levels. Saudi residents younger than 18 years were excluded from the study.

Data collection, instrument, and score system

A questionnaire was developed to gather data based on a thorough assessment of several previous studies of this type [2,3,7,11]. The questions were multiple-choice based, included three elements, and comprised 70 questions. The first section consisted of 16 questions regarding demographic data. The second portion contained 12 questions concerning the participant experiences with childcare.
The awareness assessment was divided into two parts. The first part, Developmental Milestones Knowledge, comprised five skills: fine motor skills, six questions; gross motor skills, seven questions; speech/language skills, eight questions; socio-emotional skills, ten questions; and cognitive skills, four questions. The second part, Knowledge Acquisition, consisted of seven questions.
The questionnaire had two versions—Arabic and English—and was distributed online using social media platforms across all regions of Saudi Arabia. Before participating, we introduced the topic to the participants and obtained their consent. Data collection was facilitated using a web-based format. All participants provided informed consent, and the data were stored securely.

Scoring system

The only part required for scoring was a knowledge assessment of developmental milestones. Incorrect responses received zero points, accurate responses received two points, and responses of "Not Sure" received one point. The highest and lowest possible score categories were based on Bloom's analysis: 80.0–100.0%, 60.0–79%, and 59.0%, respectively. The participants were divided into three groups

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based on their ratings. Starting with Fine motor development with six questions, knowledge scores ranging from 0 to 12 points were categorized as high knowledge (10–12), moderate knowledge (7–9), and low knowledge (0–6). The same goes for the other developmental skills: gross motor development (high: 11–14; moderate: 8–10, low: 0–7); speech/language development (high: 13–16, moderate: 10–12, low: 0–9); social/emotional milestone development (high: 16–20, moderate: 12–15, low: 0–11); and cognitive development (high: 7–8, moderate: 5–6, low: 0–4).
The questionnaire was administered to 20 people who were asked to complete it. This was done to assess the simplicity and practicality of the questionnaire. Data from the pilot study were omitted.

Statistical analysis
The collected data were entered into a computer using Microsoft Excel for Microsoft 365 MSO Version 2406 for Windows. Data were subsequently analyzed using IBM Statistical Package for the Social Sciences (SPSS, Version 29, IBM, Armonk NY).

Results
Table 1 displays the various demographic parameters of the participants (n = 924). The age distribution revealed a diverse range, with a notable proportion of participants under the age of 23 years (27.7%), and a comparable percentage over 35 years, indicating a balanced representation of youths and older adults. The predominance of females (74.7%) compared to males (25.3%) suggests a significant gender skew in the sample, which may influence outcomes related to family roles and educational engagement. Furthermore, marital status trends show that most participants (58.3%) were single, whereas only a small fraction were divorced or widowed. Educational attainment was striking, with nearly half of participants holding a bachelor's degree (46.5%), which likely correlated with their employment status, where students constituted a significant segment (37.2%). A high percentage of Saudi nationals (94.6%) and urban residents (95.2%) emphasized the cultural and geographic context of the sample.

Table 1. Sociodemographic characteristics of participants (n = 924).

Parameter		**N**	**Percent (%)**
Age (mean: 30.4, SD: 11.5)	< 23	256	27.7
	23–25	218	23.6
	26–35	194	21.0
	> 35	256	27.7
Gender	Female	690	74.7
	Male	234	25.3
Marital status	Single	526	56.9
	Married	368	39.8
	Divorced	24	2.6
	Widowed	6	.6
Nationality	Saudi	874	94.6

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	Non-Saudi	50	5.4
Region	Northern region	14	1.5
	Southern region	38	4.1
	Central region	406	43.9
	Eastern region	314	34.0
	Western region	152	16.5
Place of residence	Village	44	4.8
	Urban	880	95.2
Educational level	Primary school	4	.4
	Middle school	18	1.9
	High school	340	36.8
	Diploma	90	9.7
	Bachelor's degree	430	46.5
	Postgraduate degree	42	4.5
Occupational status	Student	344	37.2
	Employed	294	31.8
	Unemployed	230	24.9
	Retired	56	6.1
Income:	Less than 1000 SAR	246	26.6
	1000-5000 SAR	262	28.4
	5001-10000 SAR	188	20.3
	10001-20000 SAR	142	15.4
	More than 20000 SAR	86	9.3
What is your main role in your family with children?	Father	70	7.6
	Brother	312	33.8
	Mother	272	29.4
	Nephew	18	1.9
	Cousin	28	3.0
	Grandfather	4	.4
	Grandmother	20	2.2
	Uncle	32	3.5
	Aunt	114	12.3
	No one	54	5.8
Number of your children	Single	456	49.4
	1–2 children	104	11.3
	3–4 children	108	11.7
	≥ 5 children	142	15.4
	Expecting first child	6	.6

ISSN:1624-1940
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	Not interested in having children	12	1.3
	Haven't had children yet Still planning	96	10.4
Were your pregnancies planned?	Yes	278	30.1
	No	136	14.7
	I don't have children	510	55.2
Age of your first child	Still pregnant	54	5.8
	1 day to less than 7 years	78	8.4
	7 years to less than 17 years	86	9.3
	17 years and more	190	20.6
	I don't have Children	516	55.8
Gender of your firstborn	Female	216	23.4
	Male	152	16.5
	I don't have Children	556	60.2
Residence of children with you	Never	258	27.9
	Partial	176	19.0
	Always	490	53.0
Do you have children with special needs?	No	882	95.5
	Yes	42	4.5

As shown in Figure 1, 460 participants (approximately 50%) agreed with the statement that a 1–4-month-old infant can track/trace an object past the midline, indicating a strong consensus on infant visual tracking capabilities within this age range. Conversely, 54 respondents, constituting approximately 6%, considered infants younger than 1 month to be capable, suggesting a limited understanding of developmental timelines in visual tracking. Furthermore, 120 respondents (13%) perceived infants older than 4 months to be capable, possibly indicating a misunderstanding of the tracking abilities typically attributed to this specific age group. Notably, 290 respondents (31%) were uncertain.

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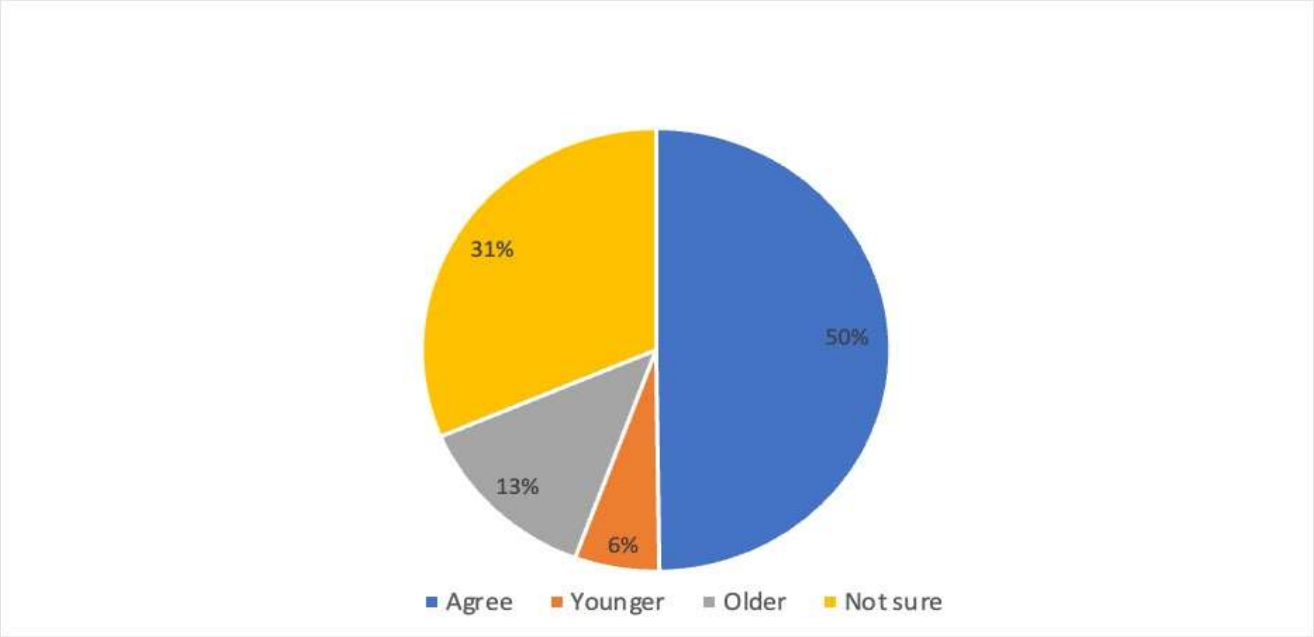
Figure 1. Proportions of participants who think that a 1–4-month-old infant can track/trace an object past the midline.



Regarding parameters related to encounters with children, as illustrated in Table 2, the highest percentage of "Never" encounters was observed within the age categories of newly born to 2 months (398 respondents, 43.1%) and 3–4 months (404 respondents, 43.7%). This suggests that a substantial portion of adults may have limited or no direct engagement with infants, potentially indicating barriers such as a lack of accessibility or opportunities for interaction. Conversely, as children progress in age, specifically from 6 years old, there is a conspicuous rise in the frequency of daily interactions, reaching 24.5% for 6-year-olds, reflecting a greater likelihood of engagement as children's social/emotional interactions expand and their independence increases.

Table 2. Parameters related to encounters with children by their age (n = 924).

Parameter	**Never**	**Rarely (few times a year)**	**Sometimes (few times a month)**	**Often (few times a week)**	**Always (daily)**
Newly born to 2 months old	398 (43.1%)	214 (23.2%)	88 (9.5%)	76 (8.2%)	148 (16.0%)
3–4 months old	404 (43.7%)	182 (19.7%)	110 (11.9%)	72 (7.8%)	156 (16.9%)
5–6 months old	398 (43.1%)	180 (19.5%)	106 (11.5%)	92 (10.0%)	148 (16.0%)
7–9 months old	386 (41.8%)	174 (18.8%)	108 (11.7%)	96 (10.4%)	160 (17.3%)

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10–12 months old	376 (40.7%)	180 (19.5%)	104 (11.3%)	114 (12.3%)	150 (16.2%)
1–1.5 years old	336 (36.4%)	156 (16.9%)	120 (13.0%)	142 (15.4%)	170 (18.4%)
1.5–2 years old	344 (37.2%)	162 (17.5%)	118 (12.8%)	148 (16.0%)	152 (16.5%)
2–2.5 years old	336 (36.4%)	146 (15.8%)	124 (13.4%)	162 (17.5%)	156 (16.9%)
3 years old	334 (36.1%)	132 (14.3%)	140 (15.2%)	162 (17.5%)	156 (16.9%)
4 years old	324 (35.1%)	126 (13.6%)	152 (16.5%)	146 (15.8%)	176 (19.0%)
5 years old	334 (36.1%)	118 (12.8%)	118 (12.8%)	170 (18.4%)	184 (19.9%)
6 years old	288 (31.2%)	118 (12.8%)	112 (12.1%)	180 (19.5%)	226 (24.5%)

The data presented in Table 3 provide a comprehensive analysis of participants' knowledge of developmental milestones in fine motor skills across various age groups, encompassing the cohort of 924 individuals. The findings indicate that there is a substantial level of agreement among participants concerning specific developmental milestones, particularly where 76.8% acknowledged that infants begin reaching for objects in the 4–6-month age group. This reflects a robust understanding of early motor development, which is crucial for subsequent skill acquisition.

Additionally, 74.5% of the respondents recognized the importance of pincer grasping and the ability to bang cubes together in 9 to 12-month-olds, further emphasizing sound awareness among participants regarding the critical phases of fine motor skill development. However, it is noteworthy that a considerable percentage of participants expressed uncertainty in their responses, particularly regarding the earliest milestone of object tracking, with 31.4% indicating that they were unsure. This uncertainty indicates a potential gap in knowledge or educational outreach regarding milestones in early infant development. Moreover, the responses for later developmental stages, such as scribbling at 12 months and shape cutting at age 5 years, indicated a good level of agreement (64.3% and 63.0%, respectively).

Table 3. Participants' knowledge assessment of developmental milestones: fine motor (n = 924).

Parameter		**N**	**Percent (%)**
1–4-month-old infant can track/trace an object past midline	Agree	460	49.8
	Younger	54	5.8
	Older	120	13.0
	Not sure	290	31.4

ISSN:1624-1940
http://magellanes.com/

4–6-month-olds start reaching for objects	Agree	710	76.8
	Younger	56	6.1
	Older	60	6.5
	Not sure	98	10.6
9–12-month-olds start pincer grasp and banging 2 cubes together	Agree	688	74.5
	Younger	66	7.1
	Older	60	6.5
	Not sure	110	11.9
12-month-olds can scribble and stack 2 cubes	Agree	594	64.3
	Younger	42	4.5
	Older	146	15.8
	Not sure	142	15.4
20–24-month-olds can close a box with a lid	Agree	628	68.0
	Younger	62	6.7
	Older	84	9.1
	Not sure	150	16.2
A 5-year-old can cut out shapes	Agree	582	63.0
	Younger	44	4.8
	Older	134	14.5
	Not sure	164	17.7

Figure 2 illustrates a survey of the perceptions of the ability of neonates to lift their chins or heads in a prone position. Of the 924 respondents, a substantial majority, representing approximately 35.5% (328 individuals), agreed that neonates could exhibit this motor skill. Meanwhile, a notable segment, constituting approximately 9.5% (88 individuals), identified this attribute in younger infants, whereas 33.1% (306 individuals) categorized this ability in older children. In addition, 22% (202 respondents) remained uncertain about this developmental milestone.

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Figure 2. Proportion of participants who think that neonates can lift their chins/heads while prone

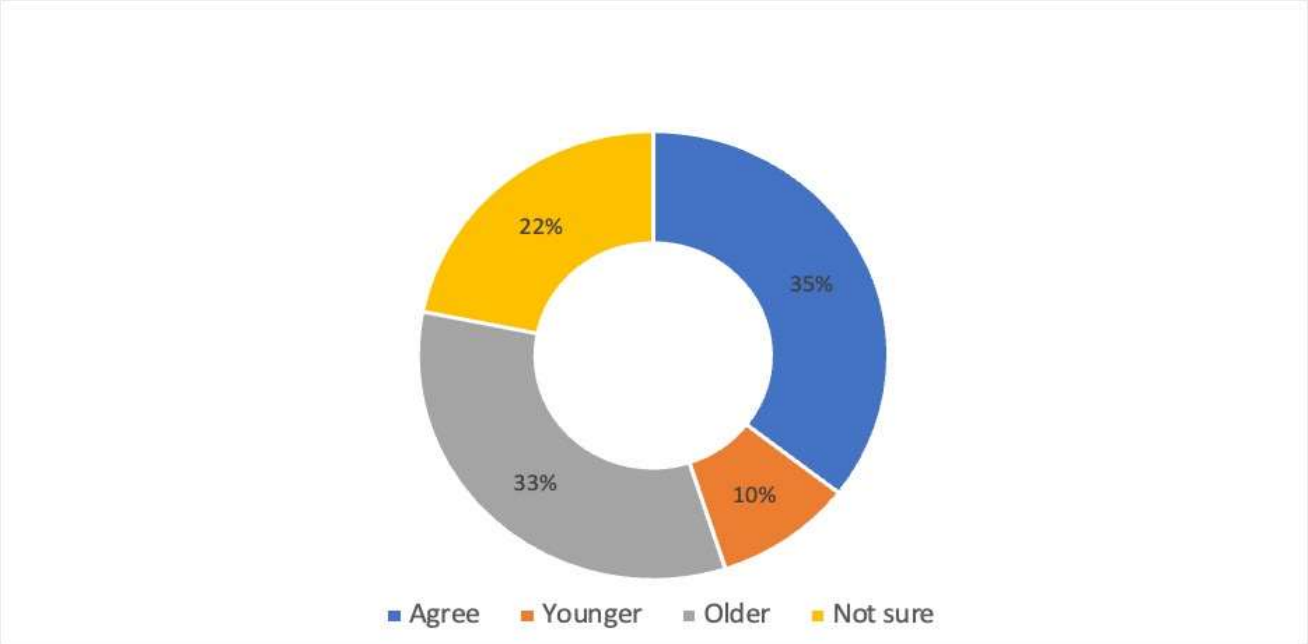

Table 4 reveals the insightful implications for understanding early childhood development. With a sample size of 924, the responses indicated variable awareness among the participants concerning specific motor abilities in children of various ages. Notably, the highest agreement was observed for gross motor achievements, such as a 3-year-old pedaling a tricycle (71.6%) and briefly standing on one leg (69.9%), suggesting a strong recognition of these milestones. Conversely, the lowest levels of confidence were evident in responses related to younger infants, particularly for milestones occurring at 2 and 4 months, where a significant number of participants expressed uncertainty (ranging from 20.3% to 27.1%).

Table 4. Participant knowledge assessment of developmental milestones: gross motor (n = 924).

Parameter		**N**	**Percent (%)**
Neonates can lift their chins/heads while prone (laying on their stomach)	Agree	328	35.5
	Younger	88	9.5
	Older	306	33.1
	Not sure	202	21.9
A 2-month-old can lift his/her shoulders while prone	Agree	334	36.1
	Younger	68	7.4
	Older	272	29.4
	Not sure	250	27.1

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Around 4 months, an infant can roll front to back	Agree	458	49.6
	Younger	58	6.3
	Older	220	23.8
	Not sure	188	20.3
Around 9 months, an infant can pull to stand	Agree	568	61.5
	Younger	46	5.0
	Older	144	15.6
	Not sure	166	18.0
First steps happen at 12 months	Agree	372	61.9
	Younger	114	12.3
	Older	102	11.0
	Not sure	136	14.7
A 3-year-old can pedal a tricycle	Agree	662	71.6
	Younger	34	3.7
	Older	90	9.7
	Not sure	138	14.9
3–5-year-olds can stand on one for few seconds	Agree	646	69.9
	Younger	38	4.1
	Older	70	7.6
	Not sure	170	18.4

The data presented in Table 5 provide a comprehensive overview of the participants' knowledge of developmental milestones specific to speech/language acquisition in early childhood, encompassing a sample size of 924 individuals. The results indicate a generally strong awareness of developmental benchmarks, with a notable 75.3% agreement that infants begin to babble by 6 months, reflecting a crucial stage in speech/language development. However, the percentage decreased to 43.3% when regarding recognizing that 24-month-olds typically achieve a vocabulary exceeding 50 words, suggesting variability in knowledge as milestones progressed. The responses also highlighted a significant degree of uncertainty, particularly in the later stages of speech/language development, as indicated by 33.1% of the participants being unsure about vocabulary milestones at 24 months.

Table 5. Participant knowledge assessment of developmental milestones: Speech/language (n = 924).

Parameter		**N**	**Percent (%)**
2-month-olds are alert to the sounds and voices around them	Agree	612	66.2
	Younger	66	7.1
	Older	102	11.0
	Not sure	144	15.6
	Agree	696	75.3

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At 6 months, a baby starts to babble "daaa, mmma, bbaa, etc.)	Younger	96	10.4
	Older	48	5.2
	Not sure	84	9.1
Around 9 months, a baby starts to respond and orient to their name	Agree	638	69.0
	Younger	82	8.9
	Older	90	9.7
	Not sure	114	12.3
Around 16–18 months, a baby can point to a picture when named	Agree	534	57.8
	Younger	52	5.6
	Older	152	16.5
	Not sure	186	20.1
18–24-month-olds start to pronounce their names	Agree	576	62.3
	Younger	74	8.0
	Older	102	11.0
	Not sure	172	18.6
24-month-olds have more than a 50-word vocabulary	Agree	400	43.3
	Younger	50	5.4
	Older	168	18.2
	Not sure	306	33.1
3–5-year-olds enjoy being read to	Agree	672	72.7
	Younger	86	9.3
	Older	34	3.7
	Not sure	172	14.3
A 5-year-old can tell which hand is right and which is left	Agree	620	67.1
	Younger	66	7.1
	Older	92	10.0
	Not sure	146	15.8

The data provided in Table 6 present a comprehensive overview of parental perceptions regarding the social/emotional and cognitive developmental milestones of infants and young children based on a sample size of 924 respondents. A notable percentage of participants (76.4%) agreed that babies aged 2-4 months begin to smile, reflecting a strong consensus on early positive emotional expressions. Additionally, 67.7% of the respondents acknowledged the prevalence of stranger anxiety by 6 months, indicating an awareness of this critical developmental phase. However, there was a significant drop in agreement regarding self-feeding capabilities at 6 months, with only 47.2% recognizing this milestone. As children progress, a substantial majority identify traits such as independence and imaginative play by 12–18 months, as well as empathy and sharing behaviors by 5–6 years, with agreements of 72.3% and 71.2%, respectively.

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Table 6. Parameters related to Knowledge Assessment of Developmental Milestones: Social/emotional and cognitive (n = 924).

Parameter	Agree	Younger	Older	Not sure
2–4-month-olds start to smile	706 (76.4%)	42 (4.5%)	70 (7.6%)	106 (11.5%)
Around 6 months, a baby fears stranger (stranger anxiety)	626 (67.7%)	72 (7.8%)	90 (9.7%)	136 (14.7%)
Around 6 months, infants can feed her/his self and holds a bottle	436 (47.2%)	78 (8.4%)	246 (26.6%)	164 (17.7%)
12–18-month-olds exert independence	324 (35.1%)	68 (7.4%)	288 (31.2%)	244 (26.4%)
18–24-month-olds can use a spoon to feed themselves	574 (62.1%)	66 (7.1%)	134 (14.5%)	150 (16.2%)
2–3-year-olds now can dress and undress themselves (except for typing their shoelaces)	498 (53.9%)	46 (5.0%)	246 (26.6%)	134 (14.5%)
3–5-year-olds start sharing their toys with other children	658 (71.2%)	80 (8.7%)	48 (5.2%)	138 (14.9%)
3-year-olds engage in imaginative play and fears imaginary things	636 (68.8%)	42 (4.5%)	78 (8.4%)	168 (18.2%)
5–6-year-olds have a best friend	668 (72.3%)	64 (6.9%)	56 (6.1%)	136 (14.7%)
5–6-year-olds show empathy	668 (72.3%)	88 (9.5%)	36 (3.9%)	132 (14.3%)
4–6-month-olds form their first bond with their caregivers	616 (66.7%)	108 (11.7%)	68 (7.4%)	172 (14.3%)
12–18-month-olds start to engage in fantasy/pretend play	430 (46.5%)	60 (6.5%)	228 (24.7%)	206 (22.3%)
2–3-year-olds begin counting	604 (65.4%)	52 (5.6%)	150 (16.2%)	118 (12.8%)
5–6-year-olds advocate for fairness (speak up when something unfair/wrong happens)	682 (73.8%)	48 (5.2%)	58 (6.3%)	136 (14.7%)

The data presented in Table 7 provide a comprehensive overview of the various sources contributing to knowledge acquisition among participants, highlighting significant trends in their preferences and reliance on different information channels. Notably, the most frequently cited sources of parenting knowledge seem to be relatives and friends, with 37.9% of the respondents indicating that they “always” turn to this group for insight, suggesting a strong inclination toward familial and peer support in parenting decisions. In contrast, more formal sources, such as parenting books and magazines, received

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minimal engagement, with 39.4% of the participants never consulting these sources. Furthermore, the Internet emerges as a vital knowledge resource, with 47.3% of participants either "always" or "often" utilizing online platforms.

Table 7. Participant knowledge acquisition (n = 924).

Parameter		**N**	**Percent (%)**
General practitioner or pediatrician	Always	242	26.2
	Often	174	18.8
	Sometimes	188	20.3
	Rarely	112	12.1
	Never	208	22.5
Relatives and friends (e.g., Mother…)	Always	350	37.9
	Often	226	24.5
	Sometimes	234	25.3
	Rarely	34	3.7
	Never	80	8.7
Parenting Books and magazines	Always	90	9.7
	Often	110	11.9
	Sometimes	206	22.3
	Rarely	154	16.7
	Never	364	39.4
Internet websites	Always	206	22.3
	Often	232	25.1
	Sometimes	258	27.9
	Rarely	102	11.0
	Never	126	13.6
Social Media posts and broadcasts	Always	152	16.5
	Often	214	23.2
	Sometimes	302	32.7
	Rarely	122	13.2
	Never	134	14.5
Parenting seminars/courses	Always	116	12.6
	Often	70	7.6
	Sometimes	182	19.7
	Rarely	166	18.0
	Never	390	42.2
TV shows	Always	104	11.3

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	Often	104	11.3
	Sometimes	242	26.2
	Rarely	176	19.0
	Never	298	32.3

The data presented in Table 8 elucidate the knowledge distribution regarding developmental milestones among the sample of 924 respondents. Notably, 31% of the participants demonstrated a high level of knowledge, indicating a commendable understanding of critical developmental stages. Meanwhile, a substantial proportion (44.8%) exhibited a moderate level of knowledge, suggesting that a significant portion of the population possessed a fair grasp, albeit lacking complete proficiency. Conversely, 24.2% of the individuals classified as having a low level of knowledge raised concerns regarding the adequacy of understanding among caregivers and professionals involved in pediatric care.

Table 8. Knowledge of developmental milestone score results.

	Frequency	**Percent**
High knowledge level	286	31.0
Moderate level	414	44.8
Low level	224	24.2
Total	924	100.0

Table 9 shows that knowledge level of developmental milestones has statistically significant relation to gender (P = 0.003), age (P = 0.0001), marital status (P = 0.0001), education level (P = 0.001), occupational status (P = 0.0001), monthly income (P = 0.0001), role in the family with children (P = 0.0001), number of children (P = 0.0001), if pregnancies were planned (P = 0.0001), age and gender of firstborn (P = 0.0001), and residence of children (P = 0.0001). A statistically insignificant relationship with nationality, region, place of residence, and whether there were children with special needs was shown.

Table 9. Relationship between knowledge of developmental milestones and sociodemographic characteristics

Parameters		**Knowledge level**		**Total (N = 462)**	**P value***
		High knowledge	**Moderate or low**		
Gender	Female	232	458	690	0.003
		81.1%	71.8%	74.7%	
	Male	54	180	234	
		18.9%	28.2%	25.3%	
Age	< 23	52	204	256	0.0001

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		18.2%	32.0%	27.7%	
	23–25	58	160	218	
		20.3%	25.1%	23.6%	
	26–35	48	146	194	
		16.8%	22.9%	21.0%	
	> 35	128	128	256	
		44.8%	20.1%	27.7%	
Marital status	Single	118	408	526	0.0001
		41.3%	63.9%	56.9%	
	Married	158	210	368	
		55.2%	32.9%	39.8%	
	Divorced	6	18	24	
		2.1%	2.8%	2.6%	
	Widowed	4	2	6	
		1.4%	0.3%	0.6%	
Nationality	Saudi	274	600	874	0.274
		95.8%	94.0%	94.6%	
	Non-Saudi	12	38	50	
		4.2%	6.0%	5.4%	
Region	Northern region	2	12	14	0.149
		0.7%	1.9%	1.5%	
	Southern region	6	32	38	
		2.1%	5.0%	4.1%	
	Central region	134	272	406	
		46.9%	42.6%	43.9%	
	Eastern region	96	218	314	
		33.6%	34.2%	34.0%	
	Western region	48	104	152	
		16.8%	16.3%	16.5%	
Place of residence	Village	14	30	44	0.899
		4.9%	4.7%	4.8%	
	City	272	608	880	
		95.1%	95.3%	95.2%	
Education level	Primary school	2	2	4	0.001
		0.7%	0.3%	0.4%	
	Middle school	2	16	18	
		0.7%	2.5%	1.9%	
	High school	92	248	340	

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		32.2%	38.9%	36.8%	
	Diploma	40	50	90	
		14.0%	7.8%	9.7%	
	Bachelor's degree	144	286	430	
		50.3%	44.8%	46.5%	
	Postgraduate degree	6	36	42	
		2.1%	5.6%	4.5%	
Occupational status	Student	90	254	344	0.0001
		31.5%	39.8%	37.2%	
	Employed	86	208	294	
		30.1%	32.6%	31.8%	
	Unemployed	80	150	230	
		28.0%	23.5%	24.9%	
	Retired	30	26	56	
		10.5%	4.1%	6.1%	
Monthly income	Less than 1000 SAR	52	194	246	0.0001
		18.2%	30.4%	26.6%	
	1000–5000 SAR	96	166	262	
		33.6%	26.0%	28.4%	
	5001–10000 SAR	74	114	188	
		25.9%	17.9%	20.3%	
	10001–20000 SAR	46	96	142	
		16.1%	15.0%	15.4%	
	> 20000 SAR	18	68	86	
		6.3%	10.7%	9.3%	
What is your main role in your family with children?	Father	24	46	70	0.0001
		8.4%	7.2%	7.6%	
	Brother	60	252	312	
		21.0%	39.5%	33.8%	
	Mother	124	148	272	
		43.4%	23.2%	29.4%	
	Nephew	8	10	18	
		2.8%	1.6%	1.9%	
	Cousin	8	20	28	
		2.8%	3.1%	3.0%	
	Grandfather	2	2	4	
		0.7%	0.3%	0.4%	
	Grandmother	10	10	20	

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		3.5%	1.6%	2.2%	
	Uncle	4	28	32	
		1.4%	4.4%	3.5%	
	Aunt	40	74	114	
		14.0%	11.6%	12.3%	
	No one	6	48	54	
		2.1%	7.5%	5.8%	
Number of your children	Single	102	354	456	0.0001
		35.7%	55.5%	49.4%	
	1-2 children	38	66	104	
		13.3%	10.3%	11.3%	
	3-4 children	44	64	108	
		15.4%	10.0%	11.7%	
	5 or more children	70	72	142	
		24.5%	11.3%	15.4%	
	Expecting first child	4	2	6	
		1.4%	0.3%	0.6%	
	Not interested in having children	4	8	12	
		1.4%	1.3%	1.3%	
	Haven't had children yet Still planning	24	72	96	
		8.4%	11.3%	10.4%	
Have your children's pregnancies been planned?	Yes	116	162	278	0.0001
		40.6%	25.4%	30.1%	
	No	58	78	136	
		20.3%	12.2%	14.7%	
	I don’t have children	112	398	510	
		39.2%	62.4%	55.2%	
Age of your first child:	Still pregnant	12	42	54	0.0001
		4.2%	6.6%	5.8%	
	1 day to less than 7 years	26	52	78	
		9.1%	8.2%	8.4%	
	7 years to less than 17 years	34	52	86	
		11.9%	8.2%	9.3%	
	17 years and more	92	98	190	
		32.2%	15.4%	20.6%	
	I don’t have Children	122	394	516	
		42.7%	61.8%	55.8%	
	Female	92	124	216	0.0001

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Gender of your firstborn:		32.2%	19.4%	23.4%	
	Male	66	86	152	
		23.1%	13.5%	16.5%	
	I don't have Children	128	428	556	
		44.8%	67.1%	60.2%	
Residence of children with you:	Never	54	204	258	0.0001
		18.9%	32.0%	27.9%	
	Partial	50	126	176	
		17.5%	19.7%	19.0%	
	Always	182	308	490	
		63.6%	48.3%	53.0%	
Do you have children with special needs?	No	276	606	882	0.305
		96.5%	95.0%	95.5%	
	Yes	10	32	42	
		3.5%	5.0%	4.5%	

*P value considered significant if ≤ 0.05.

Discussion

Children's development is a crucial indicator of overall growth and motor readiness. The term "developmental milestone" refers to various motor, cognitive, social/emotional, and speech/language skills exhibited by a child throughout the maturation process [13]. It is important to recognize that these milestones vary across age groups. In addition, individuals progress at their own unique pace, making it challenging to accurately predict the exact timing of skill acquisition. Nevertheless, developmental milestones offer a general guideline for when to expect specific changes as the child ages [14]. Understanding these milestones will influence how effectively and safely caregivers can nurture and engage with their children. Child development awareness can be attained by learning about early childhood milestones, ongoing developmental stages, and acquiring parenting skills. Research conducted in several developed nations has shown that a mother's understanding of their children's development is positively linked to their ability to enhance the child's development [15]. The knowledge that parents possess regarding caregiving and child-rearing is vital for a child's motor growth, cognitive abilities, and emotional development. Parents' proficiency in raising their children plays a critical role in shaping their children's thought processes and has a profound effect on early brain organization and development [16]. Moreover, the sources from which parents obtain their knowledge of parenting also significantly influence their approaches to child-rearing. Our study also showed that female sex, older age, marriage, being the mother of a child, and having five or more offspring were all related to higher knowledge scores.

Our findings regarding the knowledge of developmental milestones align with previous research, indicating notable gaps in parental knowledge regarding developmental milestones. While our study demonstrated a commendable recognition of gross motor skills in older children, it also highlighted the

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significant uncertainty surrounding infant milestones, particularly at the critical ages of 2 and 4 months, with 20.3% to 27.1% of participants lacking confidence. This contrasts with the findings from Aldayel et al. [17], where 80.0% of the respondents displayed a poor level of knowledge across all developmental domains, despite mothers showing better knowledge (21.0%) than fathers (10.0%). Notably, Aldayel et al. found that parents demonstrated the most competence in motor development (52.3%), while knowledge of cognitive, social/emotional development was considerably lower, echoing our results concerning diminished awareness of speech/language milestones as children aged, and the underutilization of formal educational resources. Similarly, Habbash et al. [18] reflected limited knowledge among parents, revealing that only 7.7% had excellent knowledge, with a higher prevalence of poor knowledge (37.6%) and acceptable understanding (48%) of developmental milestones. Notably, 81.1% of the participants recognized motor developmental milestones, which is consistent with our findings regarding gross motor skills. However, both studies underscore the reliance on the Internet as a primary information source, paralleling our observation that parents turn predominantly to informal networks rather than healthcare professionals or parenting literature. Alqurashi et al. [19] similarly indicated limited overall knowledge of developmental milestones among Saudi mothers, further emphasizing the discrepancies influenced by factors such as maternal age and education. In comparison to our findings, Alghamdi et al. [20] indicate a stark gap in knowledge regarding developmental milestones among parents, with only 11% of participants meeting the required knowledge threshold despite a considerable educational background within the sample. This could be attributed to the developmental milestones not being included in general education. Interestingly, while motor skills were recognized with higher accuracy, similar to our findings, the speech/language and social/emotional domains were less understood, echoing the decline in speech/language awareness highlighted in our study, particularly at the 24-month milestone.

Additionally, Aldayel et al. [21] emphasized that four-fifths of their participants exhibited poor knowledge levels, 14.2% had a “fair” level of knowledge, 2.3% showed a “good” level, and only 0.1% had an “excellent” level of knowledge in all of four developmental domains, aligning with our observation that a substantial portion of parents (24.2%) were classified as having low knowledge. Furthermore, a study conducted in Iraq revealed that a significant majority (71.5%) relied on personal experience as their primary source of information about developmental milestones [22], underscoring a trend similar to our results, where informal sources were also heavily relied upon. Another study conducted by Alhayli et al. [23] revealed that the primary sources of information regarding developmental milestones were medical education websites, mothers’ families, healthcare providers, and the presence of an older child, with most respondents (62.40%) seeking information from medical physicians and pediatricians.

This study had some limitations. First, the reliance on self-reported data may introduce bias, as participants might overestimate their knowledge or misinterpret questions. Additionally, although the study included a diverse sample of adults from various provinces in Saudi Arabia, the results may not be generalizable to all populations, particularly to those outside urban areas or those with limited access to education and healthcare resources.

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Conclusion

We highlight a gap in the knowledge of developmental milestones among the adult population in Saudi Arabia, and shows that the knowledge level of developmental milestones has a statistically significant relationship with gender, age, marital status, education level, occupational status, and monthly income. The reliance on informal sources of knowledge rather than formal resources such as healthcare professionals or parenting literature further complicates this situation. These findings underscore the urgent need for targeted public health education campaigns aimed at improving the awareness and understanding of developmental milestones, particularly among low-income populations. By enhancing our knowledge of this area, we can facilitate better parenting practices, reduce the incidence of developmental delays, and ultimately contribute to healthier childhood development nationwide.

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Informed Consent Statement:
Informed consent was obtained from each participant after explaining the study and clarifying that their participation was voluntary. The collected data were saved and used for research purposes only.

Data Availability Statement:
All data associated with this study are present in the paper.

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Conflicts of Interest:
The authors declare no conflicts of interest.

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