

Knowledge, attitude and practice of Kegel exercise among pregnant women in Abha, Saudi Arabia

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ABSTRACT

Background: Kegel exercise or pelvic floor muscle exercise helps in improving the strength of the pelvic floor muscles and building up their function. **Objective:** To assess the knowledge, attitude and practice of Kegel exercise among pregnant women in primary health care (PHC) setting in Abha City, Saudi Arabia. **Methods:** A cross-sectional study was conducted among 370 pregnant women. Data were collected using a structured questionnaire. Descriptive statistics, Chi-square tests, and *P* values were used to analyse the data. **Results:** Pregnant women with a higher level of education and an income of 5000 to 10000 SAR demonstrated a higher proportion of good practice. The presence of specific chronic diseases, such as psychiatric disorders and diabetes mellitus, was significantly associated with poor practice. Physicians were identified as the primary source of information about Kegel exercises, followed by social media and family/friends. **Conclusion:** The findings suggest that education, income level, chronic diseases and the source of information play significant roles in the practice of Kegel exercises among pregnant women. Healthcare providers should provide comprehensive education and ensure equal access to resources for all pregnant women. Tailored support should be provided to women with chronic diseases, and healthcare professionals should actively discuss Kegel exercises during antenatal visits. The study emphasizes the importance of multidimensional approaches to promote the practice of Kegel exercises during pregnancy and enhance pelvic floor health.

Keywords: Attitude, Kegel exercise, knowledge, practice, pregnant women, Saudi Arabia

Introduction

Pregnant females should have a good chance to practise exercise routines and also to keep on those habits. Antenatal

exercises (ANEx) are introduced for proper health of both pregnant women and fetuses.^[1,2] National Institute for Health and Care Excellence (NICE) guidelines and the American Congress of Obstetricians and Gynecologists (ACOG) reported that ANEx has low risks and significant benefits, even though minimal adaptation is needed according to maternal and foetal needs. ACOG suggested that light-to-moderate exercise for half an hour on most days of the

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week ends with weight control, minimal probability of gestational diabetes mellitus (GDM) and improved psychological well-being^[3,4] Kegel exercise or pelvic floor muscle exercise was initiated by Dr Arnold H. Kegel in 1948 to help in improving the strength of the pelvic floor muscles and building up their function. This helps females to control urinary bladder and bowel movements and enhance sexual satisfaction.^[5] Kegel exercise showed a significant role in controlling stress urinary incontinence among females^[6,7] especially during the antenatal and postnatal periods.^[8]

The performance of pelvic floor muscle training (PFMT) (Kegel exercise) during the antenatal and postnatal periods has been highly advised to treat pelvic floor dysfunction.^[9,10] The prophylactic role against pelvic floor dysfunction before delivery has not yet been well studied.^[11] A systematic review estimated that the supervised PFMT is required to include the exercise programmes in the women's routines.^[12] Therefore, the Kegel exercise should be taught to all mothers during antenatal visit/ classes or before they were discharged following delivery.

Education should be provided using different accessible methods, especially for women with high parity and those not planning to attend formal antenatal care (ANC) visits. Regrettably, there is limited research available on this topic. Assessing pregnant women knowledge, attitude and practice will help in mapping the situation in the study areas and detect females' needs. The results may be shared with public and medical practitioners to improve the attitudes and implement the practices. With this background, the study was conducted to assess the knowledge, attitude and practice of Kegel exercise among pregnant women in primary health care (PHC) setting in Abha City, Saudi Arabia.

Methodology

Study setting

The study was conducted at primary healthcare clinics (PHCCs) in Abha City, Saudi Arabia. Two PHCCs, Wasat Abha and Amahalal, located in different urban regions of Abha City, were selected.

Study design

A descriptive questionnaire-based cross-sectional approach was employed.

Study duration

The study was conducted from 1 January 2022 to 1 March 2022 with approximately 6-month duration.

Study population

The study targeted all accessible pregnant females attending the selected PHCCs in Abha City during the study period.

Research question: What is knowledge, attitude and practice level regarding Kegel exercise and its determinants among the pregnant women, in PHC setting, Abha City, Saudi Arabia?

Inclusion Criteria: Pregnant females aged 18 years or more residing in Abha City and willing to participate in the study.

Exclusion Criteria: Non-pregnant females, and those having chronic musculoskeletal disorders.

Sample size

A sample size of 370 was determined based on an estimated average knowledge level of pregnant women regarding Kegel exercise in the literature (60%) and assuming a non-response rate of 5%, alpha of 0.05, confidence interval of 95% and precision of 5%.

Sampling technique

A two-stage cluster sampling technique was employed. In the first stage, 10% of the PHCCs in Abha City were comprehensively selected. In the second stage, pregnant women attending the selected centres were included using a systematic random sample, including every third eligible female until the required sample size was achieved. The distribution of women among selected PHCCs was based on probability proportionate to size (weighted selection).

Data collection procedure

After obtaining permission from the Institutional Ethics Committee, data were collected from healthcare workers using a pre-structured questionnaire. The questionnaire was developed by the researchers in collaboration with experts and based on a review of the literature. The questionnaire consisted of multiple sections covering participants' sociodemographic data, obstetric and gynaecological history, medical history, family history of musculoskeletal disorders, ANC visit frequency, the role of physicians in health education during these visits and items to assess women's knowledge, practice and attitude towards Kegel exercise and its effects.

Statistical analysis

The collected data were coded and analysed using the Statistical Package for Social Sciences (SPSS version 26). Descriptive analysis was performed to present categorical data as frequencies and percentages, while continuous data were presented based on normality distribution. Inferential statistics were conducted to determine factors associated with better knowledge, attitude and practice. The threshold for statistical significance was set at $P < 0.05$. The knowledge, attitude and practice scores, represented as a percentage, was calculated by summing the correct responses across all knowledge, attitude and practice items, respectively. Good knowledge, attitude or practice denoted 50% or more correct responses.

Results

Of the total 370 pregnant females, a higher proportion attended the Wasat Abha Centre (44.6%) and Al-Mahala (44.1%) and Almowazafeez (11.4%) PHCCs. [Table 1] The majority were aged between 25 and 34 years (51.9%), had a university education

or higher (71.4%) and were housewives (58.6%). About 60.8% were not working, while 23.5% had jobs that involved more walking or standing.

The highest proportion of participants (34.9%) had average monthly income ranging from 5000 to 10000 Saudi Arabian Riyals (SAR). Nearly 36.5% of females had a normal body mass index (BMI). [Table 1]

The majority (57.3%) reported visiting PHCCs regularly for ANC [Figure 1]. About half never received information by doctors regarding exercises during pregnancy [Figure 2]. The most common sources of information about Kegel exercises were social media (31.9%). About 31.6% of the participants had no information about Kegel exercises ever before. [Figure 3]

Table 2 presents the Kegel exercise knowledge items and scores.

About 54.9% of the participants knew about the Kegel exercises. The majority (70.8%) correctly recognized that Kegel exercises strengthen the pelvic muscles. Additionally, 49.7% acknowledged that Kegel exercises reduce the perinatal and postnatal back pain hazards. Similarly, 48.4% acknowledged that Kegel exercises help tolerate delivery pain.

A higher proportion of participants were unaware that Kegel exercises prevent excessive weight gain (56.8%), and did not recognize their role in preventing lower limb oedema (63.5%). Nearly, 45.4% believed that Kegel exercises reduce medical interventions during labour. Moreover, 54.1% acknowledged

that Kegel exercises enhance postnatal recovery. About 39.2% recognized that Kegel exercises help in reducing the difficulty of breathing during pregnancy.

Only 14.9% acknowledged that Kegel exercises can help avoid premature labour. Similarly, 34.3% recognized that Kegel exercises minimize uterine contractions.

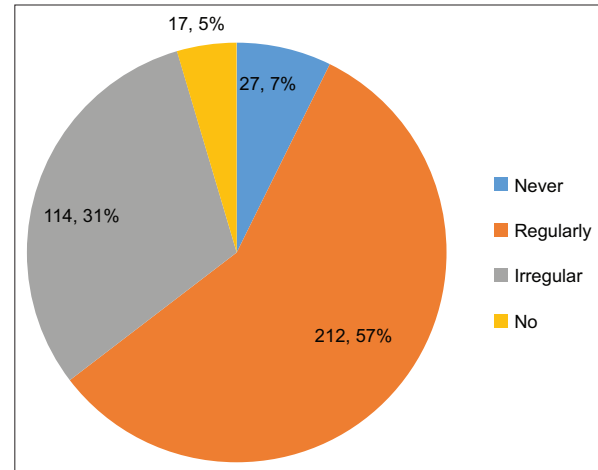


Figure 1: Participants visiting PHCC for ANC

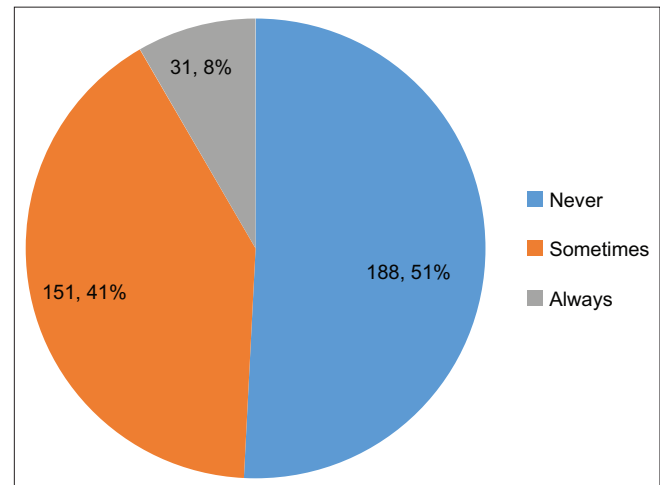


Figure 2: Information regarding Kegel exercises provided by doctor during pregnancy

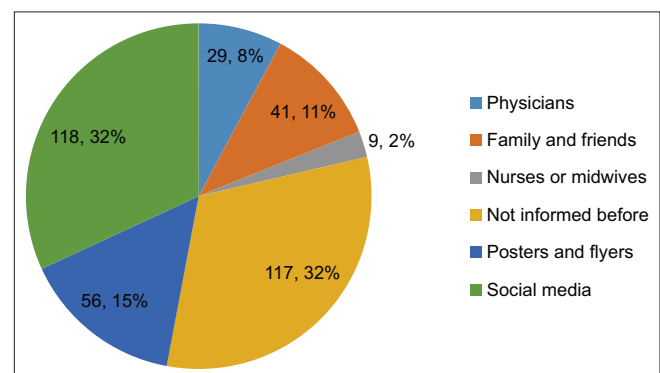


Figure 3: Source of information about Kegel exercise

Table 1: Sociodemographic characteristics of the study participants

Variables	Frequency	(%)
PHCCs	Al-Mahala	163 (44.1%)
	Almowazafeez	42 (11.4%)
	Wasat Abha	165 (44.6%)
Age, years	18 – 24	57 (15.4%)
	25 – 34	192 (51.9%)
	35 – 44	104 (28.1%)
	45 or more	17 (4.6%)
Educational level	University or more	264 (71.4%)
	Secondary education	86 (23.2%)
	Primary or intermediate education	20 (5.4%)
Occupation	Housewife	217 (58.6%)
	Healthcare system	36 (9.7%)
	Other fields	117 (31.6%)
Nature of work	More walking or standing	87 (23.5%)
	More sitting	58 (15.7%)
	Not working	225 (60.8%)
Average monthly income, SAR	<5000	125 (33.8%)
	>10000	116 (31.4%)
	5000 to 10000	129 (34.9%)
Body mass index	Normal	135 (36.5%)
	Obese	104 (28.1%)
	Overweight	119 (32.2%)
	Underweight	12 (3.2%)

The average knowledge score was 35.6 ± 31.5 . Based on the score, 31.4% of the participants demonstrated good knowledge, while 68.6% had poor knowledge.

Table 3 presents the results of the attitude items and scores related to Kegel exercises.

Nearly 58.4% of the participants agreed that Kegel exercises were essential, indicating a positive attitude towards their importance. About 41.1% agreed that Kegel exercises match their traditions. Only 4.3% believed that Kegel exercises were not risky for their baby. The majority (50.8%) agreed that Kegel exercises would minimize perinatal complications. About 57.3% of the participants believed that Kegel exercises give an energetic feel. A quarter (25.1%) agreed that Kegel exercises should be conducted with medical supervision.

The average attitude score was 39.5 ± 29.3 . Based on the score, 51.9% of the participants demonstrated a positive attitude.

Table 4 presents the results related to the practice of Kegel exercises and the barriers reported.

Only 29.7% of the participants did not have time for practising Kegel exercises. Additionally, 57% of the participants did not practise Kegel exercises.

The barriers reported were no time (57%), feeling tired (49.7%), non-access to facilities (68.9%) and forgetting (70.8%).

The average practice score was 53.1 ± 26.3 . Based on the score, 55.9% of the participants demonstrated good practice.

Table 5 presents the associations between pregnant women's knowledge of Kegel exercises and various characteristics. No significant association was found between the knowledge of Kegel exercises and the different PHCCs. Age did not show a significant association with knowledge, although there was a trend indicating that younger women had slightly better knowledge. Educational level was found to be significantly associated with knowledge, with women who had a university degree or higher demonstrating better knowledge compared to those with secondary education or primary/intermediate education.

Table 2: Kegel exercise knowledge items and scores (n=370)

Knowledge items	No	I don't know	Yes
Know about the Kegel exercise	91 (24.6%)	76 (20.5%)	203 (54.9%)
Kegel exercise reduces the risk of gestational diabetes	80 (21.6%)	232 (62.7%)	58 (15.7%)
Kegel exercise strengthens the pelvis muscles	3 (0.8%)	105 (28.4%)	262 (70.8%)
It reduces the hazard of perinatal and postnatal back pain	17 (4.6%)	169 (45.7%)	184 (49.7%)
Help to tolerate delivery pain	21 (5.7%)	170 (45.9%)	179 (48.4%)
Prevent excessive weight gain	64 (17.3%)	210 (56.8%)	96 (25.9%)
Prevent lower limb oedema	46 (12.4%)	235 (63.5%)	89 (24.1%)
Prevent postnatal abdominal muscle weakness	21 (5.7%)	177 (47.8%)	172 (46.5%)
Reduce medical interventions during labour	20 (5.4%)	182 (49.2%)	168 (45.4%)
Enhance postnatal recovery	8 (2.2%)	162 (43.8%)	200 (54.1%)
Help in difficulty of breathing during pregnancy	24 (6.5%)	201 (54.3%)	145 (39.2%)
Minimize chest pain during pregnancy	66 (17.8%)	233 (63%)	71 (19.2%)
Uncontrolled HTN during pregnancy	63 (17%)	234 (63.2%)	73 (19.7%)
Avoid premature labour	55 (14.9%)	225 (60.8%)	90 (24.3%)
Minimize uterine contractions	29 (7.8%)	214 (57.8%)	127 (34.3%)
Help in decreased foetus movement	93 (25.1%)	239 (64.6%)	38 (10.3%)
Minimize vaginal bleeding	36 (9.7%)	248 (67%)	86 (23.2%)
Knowledge score (%)		35.6+31.5	
Good knowledge (50% or more)		116 (31.4%)	
Poor knowledge		254 (68.6%)	

Table 3: Kegel exercise attitude items and scores (n=370)

Attitude items	Agree	Don't know	Disagree
Kegel exercise is essential	216 (58.4%)	117 (31.6%)	37 (10%)
Kegel exercise matches our traditions	152 (41.1%)	153 (41.4%)	65 (17.6%)
Kegel exercise is not risky for my baby	16 (4.3%)	172 (46.5%)	182 (49.2%)
Kegel exercise will minimize perinatal complications	188 (50.8%)	170 (45.9%)	12 (3.2%)
Kegel exercise gives an energetic feel	212 (57.3%)	143 (38.6%)	15 (4.1%)
Kegel exercise should be conducted with medical supervision	93 (25.1%)	168 (45.4%)	109 (29.5%)
Attitude score (%)		39.5+29.3	
Positive attitude (50% or more)		192 (51.9%)	
Negative attitude		178 (48.1%)	

Occupation also showed a significant association with knowledge, where housewives had poorer knowledge

compared to women working in the healthcare system or other fields.

Table 4: Kegel exercise practice and barrier items and scores (n=370)

Practice items	No	Yes
Did you have time to practise the Kegel exercise	110 (29.7%)	260 (70.3%)
Do you practise the Kegel exercise	211 (57%)	159 (43%)
Barrier: Don't know about it	200 (54.1%)	170 (45.9%)
Barrier: No time	211 (57%)	159 (43%)
Barrier: Feeling tired	184 (49.7%)	186 (50.3%)
Barrier: Non-access for facilities	255 (68.9%)	115 (31.1%)
Barrier: Forgetting	108 (29.2%)	262 (70.8%)
Practice score (%)	53.1+26.3	
Good practice (50% or more)	207 (55.9%)	
Poor practice	163 (44.1%)	

The nature of work, average monthly income and BMI did not show significant associations with knowledge.

The frequency of visiting PHCCs for ANC and the information provided by doctors regarding exercises during pregnancy did not show significant associations with knowledge. Women who reported that doctors never provided them with information regarding exercises during pregnancy had poorer knowledge.

The source of information about Kegel exercises showed a significant association with knowledge. Women who received information from physicians, posters/flyers or social media had better knowledge compared to those who relied on family and friends, nurses/midwives, or were not informed before.

Table 5: Knowledge of pregnant women towards Kegel exercises in association with characteristics (n=370)

Parameter		Knowledge		χ^2	P
		Good knowledge	Poor knowledge		
PHCCs	Al-Mahala	50 (30.7%)	113 (69.3%)	0.083	0.959
	Almowazafeez	13 (31%)	29 (69%)		
	Wasat Abha	53 (32.1%)	112 (67.9%)		
Age, years	18 – 24	20 (35.1%)	37 (64.9%)	6.992	0.072
	25 – 34	68 (35.4%)	124 (64.6%)		
	35 – 44	22 (21.2%)	82 (78.8%)		
	45 or more	6 (35.3%)	11 (64.7%)		
Educational level	University or more	91 (34.5%)	173 (65.5%)	6.277	0.043*
	Secondary education	23 (26.7%)	63 (73.3%)		
	Primary or intermediate education	2 (10%)	18 (90%)		
Occupation	Housewife	59 (27.2%)	158 (72.8%)	6.398	0.041*
	Healthcare system	17 (47.2%)	19 (52.8%)		
	Other fields	40 (34.2%)	77 (65.8%)		
Nature of work	More walking or standing	33 (37.9%)	54 (62.1%)	3.188	0.203
	More sitting	20 (34.5%)	38 (65.5%)		
	Not working	63 (28%)	162 (72%)		
Average monthly income, SAR	Less than 5000	33 (26.4%)	92 (73.6%)	6.202	0.045*
	More than 10000	32 (27.6%)	84 (72.4%)		
	5000 to 10000	51 (39.5%)	78 (60.5%)		
Body mass index	Normal	49 (36.3%)	86 (63.7%)	6.003	0.111
	Obese	27 (26%)	77 (74%)		
	Overweight	39 (32.8%)	80 (67.2%)		
	Underweight	1 (8.3%)	11 (91.7%)		
Visiting PHCC for ANC	Never	7 (25.9%)	20 (74.1%)	2.448	0.485
	Regularly	67 (31.6%)	145 (68.4%)		
	Irregular	34 (29.8%)	80 (70.2%)		
	No	8 (47.1%)	9 (52.9%)		
Information regarding Kegel exercises provided by the doctor	Never	38 (20.2%)	150 (79.8%)	22.563	0.000*
	Sometimes	63 (41.7%)	88 (58.3%)		
	Always	15 (48.4%)	16 (51.6%)		
Source of information about the Kegel exercise	Physicians	13 (44.8%)	16 (55.2%)	63.799	0.000*
	Family and friends	13 (31.7%)	28 (68.3%)		
	Nurses or midwives	5 (55.6%)	4 (44.4%)		
	Not informed before	8 (6.8%)	109 (93.2%)		
	Posters and flyers	35 (62.5%)	21 (37.5%)		
	Social media	42 (35.6%)	76 (64.4%)		

Table 6 presents the attitude of pregnant women towards Kegel exercises in association with various characteristics. There were no significant differences in attitude among pregnant women attending different PHCCs ($P = 0.471$) and among the age groups ($P = 0.755$).

The results reveal a significant association between educational level and attitude towards Kegel exercises ($P < 0.001$). Pregnant women with a university education or higher showed a more positive attitude compared to those with lower levels of education.

Although there was a slightly higher proportion of positive attitude among healthcare professionals, the association between occupation and attitude ($P = 0.081$) and between the nature of work and attitude towards Kegel exercises ($P = 0.407$) was insignificant.

A significant association between income level and attitude ($P = 0.040$) was observed. Pregnant women with an average monthly income of 5000 to 10000 SAR showed the highest proportion of positive attitude.

No significant association between BMI and attitude towards Kegel exercises ($P = 0.095$) was found.

Other variables, such as visiting PHCCs for ANC, information provided by doctors regarding exercises during pregnancy and sources of information about Kegel exercise, showed no significant associations ($P > 0.05$).

Table 7 provides information on the practice of pregnant women towards Kegel exercises in relation to various characteristics and barriers. No significant differences in practice among pregnant women attending different PHCCs ($P = 0.305$) were observed.

Table 6: Attitude of pregnant women towards Kegel exercises in association with characteristics (n=370)

Parameter		Attitude		χ^2	P
		Positive Attitude	Negative attitude		
Primary healthcare centre (PHCC)	Al-Mahala	79 (48.5%)	84 (51.5%)	1.507	0.471
	Almowazafeez	24 (57.1%)	18 (42.9%)		
	Wasat Abha	89 (53.9%)	76 (46.1%)		
Age, years	18-24	29 (50.9%)	28 (49.1%)	1.194	0.755
	25-34	103 (53.6%)	89 (46.4%)		
	35-44	50 (48.1%)	54 (51.9%)		
	45 or more	10 (58.8%)	7 (41.2%)		
Educational level	University or more	158 (59.8%)	106 (40.2%)	24.809	0.000*
	Secondary education	30 (34.9%)	56 (65.1%)		
	Primary or intermediate education	4 (20%)	16 (80%)		
Occupation	Housewife	102 (47%)	115 (53%)	5.025	0.081
	Healthcare system	21 (58.3%)	15 (41.7%)		
	Other fields	69 (59%)	48 (41%)		
Nature of work	More walking or standing	47 (54%)	40 (46%)	1.8	0.407
	More sitting	34 (58.6%)	24 (41.4%)		
	Not working	111 (49.3%)	114 (50.7%)		
Average monthly income, SAR	Less than 5000	54 (43.2%)	71 (56.8%)	6.444	0.040*
	More than 10000	62 (53.4%)	54 (46.6%)		
	5000 to 10000	76 (58.9%)	53 (41.1%)		
Body mass index	Normal	63 (46.7%)	72 (53.3%)	6.359	0.095
	Obese	50 (48.1%)	54 (51.9%)		
	Overweight	73 (61.3%)	46 (38.7%)		
	Underweight	6 (50%)	6 (50%)		
Visiting PHCCs for ANC	Never	12 (44.4%)	15 (55.6%)	13.21	0.004*
	Regularly	123 (58%)	89 (42%)		
	Irregular	45 (39.5%)	69 (60.5%)		
	No	12 (70.6%)	5 (29.4%)		
Information regarding Kegel exercises provided by the doctor	Never	88 (46.8%)	100 (53.2%)	4.414	0.11
	Sometimes	88 (58.3%)	63 (41.7%)		
	Always	16 (51.6%)	15 (48.4%)		
Source of information about the Kegel exercise	Physicians	24 (82.8%)	5 (17.2%)	118.074	0.000*
	Family and friends	27 (65.9%)	14 (34.1%)		
	Nurses or midwives	7 (77.8%)	2 (22.2%)		
	Not informed before	13 (11.1%)	104 (88.9%)		
	Posters and flyers	43 (76.8%)	13 (23.2%)		
	Social media	78 (66.1%)	40 (33.9%)		

Although there was a slight trend towards higher poor practice among younger age groups, the association between age and practice was not statistically significant ($P = 0.051$).

A significant association between educational level and practice towards Kegel exercises ($P = 0.009$) was found. Pregnant women with a higher level of education demonstrated a higher proportion of good practice.

The results indicate no significant association between occupation and practice ($P = 0.653$), between the nature of work and practice towards Kegel exercises ($P = 0.516$) and between BMI and practice towards Kegel exercises ($P = 0.14$).

A significant association between income level and practice ($P = 0.004$) was found. Pregnant women with an

income of 5000 to 10000 SAR showed the highest proportion of good practice.

Significant associations were found between the frequency of visiting PHCCs for ANC, and the source of information about Kegel exercises ($P < 0.05$) and practice.

Discussion

Several studies have examined the knowledge, attitudes and practices of pregnant women regarding pelvic floor muscle exercises, which include Kegel exercises. One of the key findings of this study is the significant association between educational level and practice among the pregnant women. This is similar to the study findings conducted in Jazan where pregnant women with higher levels of knowledge were more motivated

Table 7: Practice and barriers of pregnant women towards Kegel exercises in association with characteristics (n=370)

	Parameter	Practice		χ^2	P
		Good practice	Poor practice		
PHCCs	Al-Mahala	97 (59.5%)	66 (40.5%)	2.372	0.305
	Almowazafeez	25 (59.5%)	17 (40.5%)		
	Wasat Abha	85 (51.5%)	80 (48.5%)		
Age, years	18 – 24	23 (40.4%)	34 (59.6%)	7.788	0.051
	25 – 34	113 (58.9%)	79 (41.1%)		
	35 – 44	59 (56.7%)	45 (43.3%)		
	45 or more	12 (70.6%)	5 (29.4%)		
Educational level	University or more	161 (61%)	103 (39%)	9.519	0.009*
	Secondary education	37 (43%)	49 (57%)		
	Primary or intermediate education	9 (45%)	11 (55%)		
Occupation	Housewife	123 (56.7%)	94 (43.3%)	0.852	0.653
	Healthcare system	22 (61.1%)	14 (38.9%)		
	Other fields	62 (53%)	55 (47%)		
Nature of work	More walking or standing	53 (60.9%)	34 (39.1%)	1.324	0.516
	More sitting	33 (56.9%)	25 (43.1%)		
	Not working	121 (53.8%)	104 (46.2%)		
Average monthly income, SAR	Less than 5000	56 (44.8%)	69 (55.2%)	10.857	0.004*
	More than 10000	67 (57.8%)	49 (42.2%)		
	5000 to 10000	84 (65.1%)	45 (34.9%)		
Body mass index	Normal	72 (53.3%)	63 (46.7%)	5.469	0.14
	Obese	56 (53.8%)	48 (46.2%)		
	Overweight	75 (63%)	44 (37%)		
	Underweight	4 (33.3%)	8 (66.7%)		
Visiting PHCCs for ANC	Never	13 (48.1%)	14 (51.9%)	20.95	0.000*
	Regularly	140 (66%)	72 (34%)		
	Irregular	47 (41.2%)	67 (58.8%)		
	No	7 (41.2%)	10 (58.8%)		
Information regarding Kegel exercises provided by the doctor	Never	107 (56.9%)	81 (43.1%)	2.628	0.269
	Sometimes	79 (52.3%)	72 (47.7%)		
	Always	21 (67.7%)	10 (32.3%)		
Source of information about the Kegel exercise	Physicians	21 (72.4%)	8 (27.6%)	32.725	0.000*
	Family and friends	24 (58.5%)	17 (41.5%)		
	Nurses or midwives	6 (66.7%)	3 (33.3%)		
	Not informed before	43 (36.8%)	74 (63.2%)		
	Posters and flyers	29 (51.8%)	27 (48.2%)		
	Social media	84 (71.2%)	34 (28.8%)		

to do pelvic floor muscle exercise.^[13] However, on the contrary, there was no association between educational level and PFMT knowledge ($P = 0.63$) in a study conducted among pregnant females in Thailand.^[14] Hill *et al.*^[15] found that 76% of respondents knew that pelvic floor muscle exercises could prevent urinary incontinence. However, only 27% were aware of its preventive effect on faecal incontinence, and 41% believed that leaking urine during pregnancy was normal. The practice of pelvic floor muscle exercises was reported by only 11% of the participants. Women's knowledge concerning the Kegel exercise in the postnatal period was found reasonable and their attitude was favourable, but they had poor practice of Kegel exercises in a study conducted in Al Madinah Al Munawwarah.^[16] Another multiregional study from Saudi Arabia found good general knowledge and awareness levels regarding exercise during pregnancy.^[17]

Temtanakitpaisan *et al.*^[14] reported that 55.5% of sampled pregnant women had knowledge about PFMT, but only 27.9% answered all related items correctly. The study found no significant association between educational level and PFMT knowledge. Additionally, only 10.7% of the aware women irregularly practised PFMT during pregnancy. These findings emphasize the need for improved knowledge dissemination and motivation to practice exercises, aligning with the objectives of this study. The women of childbearing age showed poor knowledge of benefits of Kegel exercises (<70%) in a China study.^[18] Our study finding suggests that education plays a crucial role in promoting awareness and understanding of the importance of Kegel exercises during pregnancy. Healthcare professionals should focus on providing comprehensive and targeted education to all pregnant women, regardless of their educational background, to ensure that they receive accurate information about Kegel exercises and their benefits.

Guerrero *et al.*^[19] found that the practice of pelvic floor exercises increased in the immediate postnatal period but declined subsequently. Only 15% of pregnant women adhered to the recommended daily practice. This highlights the challenge of maintaining a consistent exercise routine and suggests the importance of continued support and guidance throughout pregnancy.

A study among Taiwanese women revealed that adherence to pelvic floor muscle exercises depends on attitudes towards the exercise, dyadic unity and perceived benefits.^[20] This highlights the need for promoting positive attitudes towards Kegel exercises among pregnant women.

Tantisiriwat and Manchana^[21] found that a majority of women visiting a gynaecologic clinic had limited understanding of pelvic floor muscle exercises, and many healthcare professionals lacked knowledge on how to instruct women properly. This points to a gap in healthcare provider education and highlights the importance of well-informed healthcare professionals who can provide accurate guidance to pregnant women regarding Kegel exercises. Whitford *et al.*^[22] reported that nearly 80% of pregnant

women lacked knowledge about pelvic floor muscle exercises, and more than 50% required additional instruction during the antenatal period. These findings align with the objectives of this study, emphasizing the need for increased awareness and education on Kegel exercises among pregnant women. The results from the Irani study showed significant increase in pelvic floor muscle strength in the intervention group at 4 and 8 weeks after exercises ($P < 0.0001$), but no significant difference was observed in the control group ($P = 0.368$). The intervention group was trained in Kegel exercises for 8 weeks.^[23]

Income level was also found to be significantly associated with the practice of Kegel exercises in this study. Pregnant women with an income of 5000 to 10000 SAR showed the highest proportion of good practice. This result implies that financial stability may positively impact a woman's ability to prioritize her health during pregnancy. However, it is important to note that access to information and resources should not be limited to those with higher incomes. Efforts should be made to ensure that all pregnant women, regardless of their income level, have equal opportunities to access educational materials, healthcare services and support for practising Kegel exercises.

In this study, pregnant women with psychiatric disorders and diabetes mellitus showed a higher proportion of poor practice. This finding suggests that pregnant women with chronic conditions may face additional challenges in incorporating Kegel exercises into their routine. Healthcare providers should pay special attention to these women, providing tailored guidance and support to help them overcome barriers and engage in regular exercise.

Physicians were identified as the primary source of information, followed by social media and family/friends in our study. Over 60% of the participants used the Internet as their primary source of healthcare information in the Chinese study, possibly because those women had easier access to the Internet.^[18] Pregnant women who received information from physicians demonstrated a higher proportion of good practice. This emphasizes the crucial role of healthcare providers in delivering accurate and timely information about Kegel exercises to pregnant women. It is essential to proactively discuss the benefits and techniques of Kegel exercises during antenatal visits, ensuring that women are well-informed and motivated to incorporate these exercises into their daily routine. Additionally, social media can serve as the platforms for disseminating information about Kegel exercises, reaching a wider audience and providing ongoing support and guidance.

Comparing the findings of this study with the existing literature,^[24-28] it is evident that there is a consistent lack of knowledge, suboptimal practice and limited awareness of the benefits of Kegel exercises among pregnant women across different populations.

The findings of this study indicate that there is room for improvement in the knowledge and practice of Kegel exercises

among pregnant women in the PHC setting. Although the results show a significant association between educational level and practice, highlighting the role of education, other variables, such as age, occupation and nature of work, did not demonstrate significant associations. This suggests that factors beyond educational background should be considered when developing interventions to promote Kegel exercise practice. Age was found to have a notable association with beliefs, awareness and knowledge scores, while marital status and functional status showed marginal, insignificant associations in another study in Al-Ahsa City.^[29] This is comparable to our study findings. A Riyadh study recommended conducting well-designed intervention sessions to promote physical activity awareness and practice among pregnant women, especially those with low education and income.^[30]

The study underscores the importance of healthcare professionals in providing accurate and comprehensive information to pregnant women during their ANC visits. The role of family physicians in educating pregnant women about the benefits of Kegel exercises should be further emphasized and integrated into routine prenatal care. The limitations of this investigation are related to the inherent nature of the data collection tool which relies on the recall of the participants. The cross-sectional design is another limitation influencing the temporal association of dependent and independent factors. Our study includes data from a particular geographical area inside the Kingdom. We hope in the future to have all the required resources to do multicentric/nationwide studies. However, an extensive analysis has been made is the strength of our study.

Conclusion

This study contributes to the understanding of the knowledge, attitude and practice of Kegel exercises among pregnant women in Abha City, Saudi Arabia. The findings highlight the need for targeted educational interventions to improve knowledge dissemination, promote positive attitudes and encourage consistent practice of Kegel exercises during pregnancy. Healthcare professionals, particularly family physicians, play a crucial role in providing accurate information and guidance to pregnant women during consultation sessions and the antenatal visits. Future research and interventions should focus on addressing the identified gaps and promoting the importance of Kegel exercises in maintaining pelvic floor health during and after pregnancy.

Ethics approval and consent to participate

All participants provided written informed consent. Confidentiality of the data was ensured, and personal identifiers were not included. The data were used solely for the purpose of scientific research. The study protocol was approved (REC-05-03-2022) by the Research Ethical Committee, Aseer Institutional Review Board, Ministry of Health, KSA, and this study was conducted in accordance with the principles laid out in the 1964 Declaration of Helsinki and its subsequent updates.

Consent for publication

Not applicable.

Availability of data and materials

The datasets used and/or analysed during this study are available from the corresponding author on reasonable request.

Authors' contributions

L.M.B.O and H.A.A. conceptualized the study and its methodology. S. A. A., F.A.A., N.M.J.A., M.A.A. and T.K.A.O investigated the study. L.M.B.O, H.A.A. and S.E.M wrote and edited the manuscript after the formal analysis. All authors read and agreed to the published version of the manuscript.

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Conflicts of interest

There are no conflicts of interest.

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