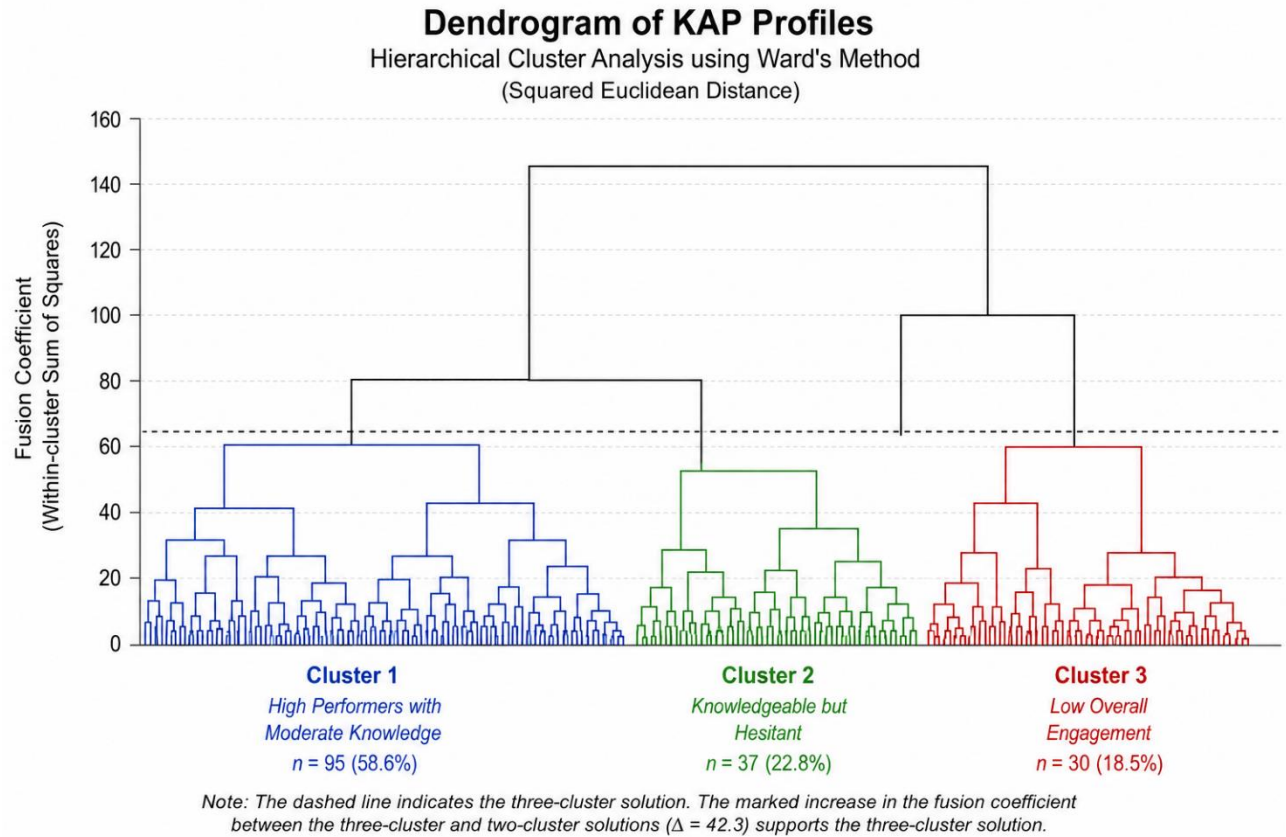


Supplementary Figure 1. Hierarchical dendrogram of knowledge, attitude, and practice (KAP) profiles among participating midwives



Supplementary Table S1: Stratified Regression Coefficients for Attitude-Practice Association and Interaction Tests

Objective: To assess the robustness of the attitude-practice association across hospital and employment subgroups and test for interaction effects.

Subgroup	n	Standardized β for Attitude	95% CI	p-value	Interaction p-value
Hospital					
Razi	55	0.44	0.19 – 0.69	0.001	0.892
Taleghani	27	0.51	0.15 – 0.87	0.008	
Imam Khomeini	57	0.49	0.26 – 0.72	<0.001	
Sina	23	0.46	0.05 – 0.87	0.032	
Employment Status					

Permanent	72	0.52	0.31 – 0.73	<0.001	0.341
Contracted	25	0.41	0.02 – 0.80	0.042	
Project-based	41	0.38	0.09 – 0.67	0.012	
Corporate	13	0.55	0.01 – 1.09	0.048	
Temporary	11	0.49	-0.17 – 1.15	0.124	
Educational Level					
Bachelor's	131	0.45	0.30 – 0.60	<0.001	0.374
Master's or higher	29	0.56	0.22 – 0.90	0.003	
Specialized Training					
Received training	137	0.49	0.34 – 0.64	<0.001	0.512
No training	25	0.40	0.01 – 0.79	0.046	

Notes: All models adjusted for knowledge scores. Interaction p-values test whether the attitude-practice association differs significantly across subgroups using interaction terms in pooled regression models. The temporary employment subgroup has small sample size (n=11); results should be interpreted with caution. Associate degree holders (n=2) were excluded from educational level subgroup analysis due to insufficient sample size.

Supplementary Table S2: Questionnaire Domains and Selected Example Items

Objective: To provide transparency regarding the content and structure of the researcher-developed KAP questionnaire.

Knowledge Domain (21 items; True/False/Don't Know format)

Sub-domain	Number of Items	Example Item	Correct Answer
COVID-19 transmission and pathophysiology	5	"SARS-CoV-2 can be transmitted from mother to fetus during pregnancy (vertical transmission)."	True
Intrapartum infection control	6	"During labor, a COVID-19 positive mother should wear a surgical mask at all times."	True

Postpartum care for infected mothers	5	"Mothers with confirmed COVID-19 should be separated from their newborns for at least 14 days regardless of symptoms."	False
Lactation and breastfeeding	3	"WHO recommends that mothers with suspected or confirmed COVID-19 should continue breastfeeding with appropriate precautions."	True
PPE and donning/doffing procedures	2	"N95 respirators must be fit-tested before use in aerosol-generating procedures."	True

Scoring: 1 point for each correct answer; 0 points for incorrect or "Don't know" responses. Total possible score: 0–21.

Attitude Domain (28 items; 0 = Strongly Disagree to 4 = Strongly Agree)

Sub-domain	Number of Items	Example Item
Perceived importance of COVID-19 precautions	5	"I believe that all pregnant women should be screened for COVID symptoms upon admission to the labor ward."
Confidence in institutional protocols	4	"I trust that our hospital's COVID-19 protocols are based on current scientific evidence."
Willingness to care for COVID-19 patients	6	"I am willing to provide intrapartum care to a COVID-19 positive mother if adequate PPE is available."
Telemedicine acceptance	4	"I believe telemedicine can be an effective tool for postpartum follow-up of mothers with COVID-19."
Perceived self-efficacy	5	"I feel confident in my ability to manage a COVID-19 positive mother during the second stage of labor."
Perceived organizational support	4	"I believe my hospital provides adequate psychological support for staff caring for COVID-19 patients."

Scoring: Raw summed scores range from 0–112. To facilitate comparison across domains, reported scores are transformed by dividing by 4 (reported range: 0–28). Higher scores indicate more positive attitudes.

Practice Domain (40 items; 0 = Never to 4 = Always)

Sub-domain	Number of Items	Example Item
Hand hygiene and PPE use	8	"I perform hand hygiene before and after each patient contact, even when wearing gloves."
Intrapartum care modifications	10	"I limit the number of personnel present in the delivery room for COVID-19 positive mothers."
Postpartum monitoring	8	"I monitor oxygen saturation levels of COVID-19 positive mothers every 4 hours during the first 24 hours postpartum."
Newborn care and breastfeeding support	7	"I educate COVID-19 positive mothers on hand hygiene before breastfeeding and wearing a mask during feeding."
Communication and documentation	4	"I clearly document COVID-19 status and related care modifications in the patient's medical record."
Environmental disinfection	3	"I ensure that delivery rooms used by COVID-19 positive mothers undergo terminal cleaning before the next patient."

Scoring: Raw summed scores range from 0–160. To facilitate comparison across domains, reported scores are transformed by dividing by 4 (reported range: 0–40). Higher scores indicate better self-reported practice adherence.

Note on Questionnaire Development: The full questionnaire (in Persian) is available from the corresponding author upon reasonable request. The questionnaire was developed by the research team through: (a) comprehensive literature review of WHO, CDC, and Iranian Ministry of Health COVID-19 guidelines; (b) qualitative interviews with five senior midwives to identify context-specific concerns; (c) content validation by a 10-member expert panel (CVR > 0.78, CVI = 0.89); (d) face validity assessment through cognitive interviews with 20 midwives; and (e) reliability testing demonstrating acceptable internal consistency (Cronbach's α : knowledge = 0.82, attitudes = 0.88, practices = 0.91) and test-retest reliability (ICC > 0.85, n=30, 2-week interval).

Supplementary Table S3: Detailed 95% Confidence Intervals for Demographic Proportions and KAP Classification

Objective: To provide complete confidence interval information as referenced in the main text, moved here to improve readability of main tables.

Table S3a: 95% Confidence Intervals for Demographic Proportions (N=162)

Variable	Category/Subgroup	n (%)	95% CI for Percentage
Age (years)	<25	22 (13.6)	8.8 – 19.9
	25-29	51 (31.5)	24.5 – 39.1
	30-34	48 (29.6)	22.8 – 37.2
	35-39	23 (14.2)	9.3 – 20.4
	40-44	10 (6.2)	3.0 – 11.1
	≥45	8 (4.9)	2.2 – 9.6
Number of Children	None	95 (58.6)	50.7 – 66.2
	1	38 (23.5)	17.2 – 30.7
	2	25 (15.4)	10.3 – 21.9
	3	3 (1.9)	0.4 – 5.3
	4	1 (0.6)	0.0 – 3.4
Professional Experience (years)	<5	78 (48.1)	40.2 – 56.1
	5-10	55 (34.0)	26.7 – 41.8
	11-15	20 (12.3)	7.7 – 18.4
	>15	9 (5.6)	2.6 – 10.3
Marital Status	Single	61 (37.7)	30.2 – 45.6
	Married	101 (62.3)	54.4 – 69.8
Educational Level	Associate	2 (1.2)	0.2 – 4.4
	Bachelor	131 (80.9)	73.9 – 86.6
	Master's or higher	29 (17.9)	12.3 – 24.7
Hospital	Razi	55 (34.0)	26.7 – 41.8
	Taleghani	27 (16.7)	11.3 – 23.3
	Imam Khomeini	57 (35.2)	27.9 – 43.1
	Sina	23 (14.1)	9.3 – 20.4
Employment Status	Permanent	72 (44.4)	36.6 – 52.5
	Contracted	25 (15.4)	10.3 – 21.9

	Temporary	11 (6.8)	3.5 – 11.9
	Corporate	13 (8.0)	4.4 – 13.4
	Project-based	41 (25.4)	18.8 – 32.7
Shift Pattern	Fixed	1 (0.6)	0.0 – 3.4
	Rotating	161 (99.4)	96.6 – 100.0
Working >8 hours/day	Yes	81 (50.0)	42.1 – 57.9
	No	81 (50.0)	42.1 – 57.9

Note: All confidence intervals calculated using the Clopper-Pearson exact method for binomial proportions. Confidence intervals for the Total row (n=162, 100%) are not reported as they represent constants.

Table S3b: 95% Confidence Intervals for COVID-19 Related Characteristics

Variable	Response	n (%)	95% CI for Percentage
History of COVID-19 infection	Yes	122 (75.3)	67.9 – 81.7
	No	40 (24.7)	18.3 – 32.1
Hospitalization for COVID-19	Yes	11 (6.8)	3.5 – 11.9
	No	151 (93.2)	88.1 – 96.5
Chronic underlying disease	Yes	27 (16.7)	11.3 – 23.3
	No	135 (83.3)	76.7 – 88.7
Family COVID-19 infection	Yes	140 (86.4)	80.1 – 91.3
	No	22 (13.6)	8.7 – 19.9
Received PPE training	Yes	151 (93.2)	88.1 – 96.5
	No	11 (6.8)	3.5 – 11.9
Received maternal care training	Yes	137 (84.6)	78.1 – 89.8
	No	25 (15.4)	10.2 – 21.9
Primary information source	WHO	86 (53.1)	45.1 – 61.0
	Ministry of Health	48 (29.6)	22.7 – 37.3
	News media	17 (10.5)	6.3 – 16.3
	Social media	11 (6.8)	3.5 – 11.9
Complete COVID-19 vaccination	Yes	161 (99.4)	96.6 – 100.0
	No	1 (0.6)	0.0 – 3.4

Note: All confidence intervals calculated using the Clopper-Pearson exact method for binomial proportions.

Table S3c: 95% Confidence Intervals for KAP Scores and Classification Levels (N=162)

Variable	Classification Level	n (%)	Mean Score (SD)	95% CI for Mean	95% CI for Percentage
Knowledge (Max=21)	Total	162 (100)	11.92 (3.83)	11.33 – 12.51	-
	Poor	49 (30.2)	-	-	23.4 – 37.8
	Moderate	92 (56.8)	-	-	48.8 – 64.5
	Good	21 (13.0)	-	-	8.3 – 19.1
Attitude (Max=28)	Total	162 (100)	19.39 (3.98)	18.77 – 20.01	-
	Poor	8 (4.9)	-	-	2.2 – 9.6
	Moderate	110 (67.9)	-	-	60.1 – 75.0
	Good	44 (27.2)	-	-	20.5 – 34.7
Practice (Max=40)	Total	162 (100)	33.34 (5.72)	32.45 – 34.23	-
	Poor	4 (2.5)	-	-	0.7 – 6.2
	Moderate	39 (24.1)	-	-	17.7 – 31.4
	Good	119 (73.5)	-	-	65.9 – 80.1

Notes: Confidence intervals for means calculated using the t-distribution (95% CI = mean $\pm$ $t_{0.025,161} \times$ SE). Confidence intervals for percentages calculated using the Clopper-Pearson exact method. KAP levels classified as poor (<50%), moderate (50-75%), or good (>75%) of maximum scores.

Supplementary Figure S1: Dendrogram from Hierarchical Cluster Analysis

[Note: In the actual manuscript submission, this would be a high-resolution figure. Below is a description of the dendrogram structure.]

Figure Description: Dendrogram illustrating the results of hierarchical cluster analysis using Ward's method with squared Euclidean distance based on standardized knowledge, attitude, and practice scores (N=162). The y-axis represents the fusion coefficient (within-cluster sum of squares). The three-cluster solution is indicated by the horizontal dashed line, showing clear separation into:

- **Cluster 1 (left branch, n=95, 58.6%):** "High Performers with Moderate Knowledge" — characterized by high practice and attitude scores with moderate knowledge.
- **Cluster 2 (middle branch, n=37, 22.8%):** "Knowledgeable but Hesitant" — characterized by moderate knowledge and practice but notably low attitude scores.
- **Cluster 3 (right branch, n=30, 18.5%):** "Low Overall Engagement" — characterized by low scores across all three KAP domains.

The marked increase in the fusion coefficient between the three-cluster and two-cluster solutions ($\Delta = 42.3$) supports the three-cluster solution. Average silhouette width = 0.31, indicating fair cluster separation.

Supplementary Materials: Additional Regression Model Including Sociodemographic Predictors

Objective: To complement the primary regression model (which examined interrelationships among KAP domains), we present a supplementary multivariable linear regression model including all sociodemographic variables significantly associated with practice scores in bivariate analyses.

Supplementary Table S4: Multivariable Linear Regression of Sociodemographic Predictors of Practice Scores (N=162)

Predictor	Unstandardized β (SE)	Standardized β	t	p-value	VIF
Constant	28.45 (2.81)	-	10.12	<0.001	-
Educational Level (Ref: Bachelor's)					
- Master's or higher	3.82 (1.24)	0.26	3.08	0.002	1.32
- Associate	-1.15 (3.98)	-0.02	-0.29	0.773	1.04

Number of Children	-0.86 (0.49)	-0.14	-1.76	0.081	1.35
Age (years)	0.04 (0.09)	0.04	0.41	0.681	1.92

Model Summary: $F(4,157) = 4.52$, $p = 0.002$; $R^2 = 0.103$; Adjusted $R^2 = 0.080$.

Notes: Only variables with $p < 0.10$ in bivariate analyses were entered into the model. Educational level (Master's or higher) remained the only significant independent predictor of practice scores. The model explained only 10.3% of variance in practice scores, substantially less than the KAP interrelationship model (23.2%), supporting the interpretation that attitudes are more proximal determinants of practices than sociodemographic characteristics alone. VIF values < 2 indicate no concerning multicollinearity. The low R^2 of this sociodemographic-only model further reinforces the conclusion that unmeasured factors (institutional, psychological, resource-related) account for the majority of variance in practice behaviors.