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Structural Equation Modeling of Medical Ethics Practices in Childbirth: Insights from Southern Iran

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Abstract

When researchers have an instrument that accurately captures how mothers perceive ethical conduct in childbirth, it becomes possible to design strategies that strengthen supportive and ethical maternity care attitudes. In this work, we sought to evaluate whether the Medical Ethics Attitude in Vaginal Delivery Questionnaire (MEAVDQ) adequately reflects the underlying constructs it is intended to measure. The research was conducted among 350 mothers, using the MEAVDQ as the primary data-collection tool. This questionnaire contains 59 items organized into three sections: Section A examines the first ethical principle, Section B focuses on the second and third principles, and Section J evaluates the fourth. To assess whether the questionnaire reflects its intended theoretical framework, construct validity was analyzed through Structural Equation Modeling (SEM).The SEM analysis demonstrated a positive association between components A and B, as well as a significant positive relationship between B and J. Furthermore, component A was found to influence J both directly and indirectly. Specifically, each one-unit increase in A resulted in a direct increase of 0.16 in J (95% CI: 0.01–0.33). Additionally, when accounting for the mediating effect of B, a one-unit increase in A led to an indirect increase of 0.39 in J (95% CI: 0.26–0.53).It is recommended that midwifery policymakers and practitioners prioritize the first principle of medical ethics—respect for autonomy—during childbirth. Upholding mothers' autonomy can contribute to a more positive and empowering birth experience.

Keywords: Equation modeling, Medical ethics practices, Childbirth, Iran

Introduction

Medical ethics in obstetrics require midwives and obstetricians to support the physical and psychological well-being of pregnant women. Ethical practices in this field encompass the clinical management of pregnancy, labor, and neonatal care. Key considerations include informing women about medically appropriate alternatives for managing pregnancy, childbirth, and neonatal care, along with the associated risks and benefits [1]. Medical ethics are shaped by a society's moral, religious, and philosophical values and are also influenced by economic, legal, and policy factors [2].

Obstetric ethics particularly emphasize women's rights to autonomy and bodily integrity [3, 4]. According to the American College of Obstetricians and Gynecologists, pregnant women's autonomous decisions should be respected, and they have the right to decline medical interventions except in exceptional circumstances [3]. Autonomy and bodily integrity are of critical importance. The rights of the fetus as a future child are also recognized, becoming increasingly significant as pregnancy progresses.

Ethical considerations regarding the status of the embryo are central to decisions in reproductive medicine [5]. Modern Protestant bioethics argues that an embryo is not an independent human being in the same sense as a newborn, as it relies entirely on the mother for acceptance and nourishment. Accordingly, the ethical obligation to protect the embryo increases with its development [6].

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The Nursing and Midwifery Council (NMC) emphasizes that understanding and obtaining informed consent are essential skills for midwives [7].

Regarding beneficence and nonmaleficence, research has shown that nearly all nurses and midwives strive to ensure patient safety and prevent harm [8]. The principle of justice, dating back to Aristotle, calls for equitable treatment of all individuals [3]. Accordingly, medical services should be delivered fairly and efficiently to all women, while also adhering to the principle of non-harm [9].

The four-principle approach—autonomy, beneficence, nonmaleficence, and justice—offers a practical framework for addressing a wide range of clinical scenarios, including childbirth [9, 10]. Respecting patient autonomy is crucial for supporting individuals' decision-making capacity, allowing them to make informed and rational choices. Healthcare providers have a moral responsibility to foster autonomy, particularly in contexts such as childbirth [9]. However, discussions of ethical issues often oversimplify the problem by appealing solely to these four principles, without considering their underlying meaning and context. Effective application requires interpreting these principles relative to the specific clinical situation [9].

Obstetric ethics, as a subset of medical ethics, focus on the rights of women, fetuses, and future children, as well as the responsibilities of healthcare providers and the broader family [3, 11]. Numerous studies have examined ethical issues in obstetrics. From a global perspective, McCullough *et al*. (2016) highlighted the importance of justice and human rights in perinatal care, while Chervenak *et al*. (2016) explored professional accountability and ethics, particularly in the context of planned home births [1, 12–14]. McCullough and colleagues proposed a model of obstetric ethics emphasizing the careful balance of ethical obligations toward pregnant women, fetuses, and neonates, contrasting with reductionist models focused solely on maternal rights [13].

A validated instrument capable of assessing mothers' attitudes toward medical ethics during childbirth can facilitate interventions aimed at promoting positive perceptions and experiences. Positive childbirth experiences have been associated with reduced preference for cesarean delivery in subsequent pregnancies. This study therefore seeks to evaluate the construct validity of the Medical Ethics Attitude in Vaginal Delivery Questionnaire (MEAVDQ) and to explore the relationships between medical ethics principles in childbirth using structural equation modeling (SEM) and confirmatory factor analysis.

Materials and Methods

Study participants

This cross-sectional study was conducted from October 2020 to January 2021, enrolling 350 women attending Kerman Hospital in Iran. According to MicyYoung (2022), this number of participants was adequate for the study's objectives [15]. Eligible participants included women with low-risk pregnancies who had delivered vaginally within the previous seven days. Any participant who chose to discontinue their participation was excluded from the study.

Questionnaire

This study employed the Medical Ethics Attitude in Vaginal Delivery Questionnaire (MEAVDQ), which consists of 59 items divided into three sections: A, B, and J. Section A examines the principle of autonomy with 19 items, Section B addresses beneficence and non-maleficence through 27 items, and Section J evaluates justice with 13 items. These sections are further subdivided into multiple dimensions: three in Section A, seven in Section B, and three in Section J [16].

Specifically, Section A's dimensions focus on providing essential information, safeguarding maternal privacy, and facilitating interactions with the mother. Section B covers aspects such as the midwife's responsibilities, fetal well-being, maternal pain, stress, overall health, the need for pain management, and relaxation. Section J emphasizes trust in the midwife, fulfilling maternal requests, and ensuring equitable treatment for all mothers [16].

The MEAVDQ has demonstrated satisfactory face and content validity, with CVR and CVI values of 0.78 and 0.89, respectively. Its construct validity was verified using exploratory factor analysis, along with empirical support through convergent validity (indicating correlation with conceptually related measures) and discriminant validity (showing minimal correlation with unrelated constructs) [17]. The variance explained by the dimensions was 62.8% for Section A, 64% for Section B, and 51% for Section J. Reliability analyses also indicated strong consistency, with ICC values ranging from 0.6 to 0.95 [16].

In this research, the MEAVDQ's construct validity was further investigated, and the interrelationships among medical ethics principles during childbirth were analyzed using structural equation modeling (SEM) and confirmatory factor analysis (CFA).

Statistical analysis

Descriptive statistics, including frequency, percentage, mean, and standard deviation, were calculated. Multiple linear regression was applied to examine the relationships between demographic factors and the various dimensions of the vaginal delivery questionnaire. Additionally, structural equation modeling (SEM) was employed to investigate the links between the principles of medical ethics and their subcomponents in childbirth, as well as to assess construct validity. SEM allows for the evaluation of both direct and indirect causal relationships among variables [18]. The resulting coefficients are interpreted similarly to Pearson correlation coefficients and regression coefficients. All statistical analyses were performed using SPSS 20 and AMOS 18, with a significance threshold set at $p < 0.05$.

Ethical consideration

Approval for this study was obtained from the Ethics Committee of Kerman University of Medical Sciences (Reg. No. 96,000,327). Afterward, authorization was granted to conduct the study in the hospital's maternity ward. The researcher provided participants with a detailed explanation of the study's purpose, assured them of the confidentiality of their information, and clarified that participation was entirely voluntary, with the option to withdraw at any point. Informed consent was formally obtained from all participants before their involvement.

Results and Discussion

The participants had a mean age of 26.87 ± 5.7 years. Most women (79%) reported having one or two pregnancies. Fewer than one-third (23.7%) had a history of miscarriage, stillbirth, or preterm delivery. Regarding educational attainment, the majority (73%) had completed only primary or middle school. Additional demographic characteristics of the study population are presented in **Table 1.**

Table 1. Description of demographic information of participants

Variable	Category	Frequency (n)	Percentage (%)
Job	Housewife	253	84.3
	Employee/Self-employed	47	15.7
Educational level	Illiterate	43	14.3
	Below diploma	219	73
	College education	38	12.7
Gravidity	1	118	39.3
	2	119	39.7
	3	45	15
	4	12	4
	5	3	1
	6	2	0.7
	7	1	0.3
History of miscarriage, stillbirth, or preterm delivery	Yes	229	76.3
	No	71	23.7
Spouse's educational level	Illiterate	45	15
	Below diploma	217	72.3
	College education	38	12.7
Spouse's job	Unemployed	27	9
	Employee	58	19.3
	Self-employed	215	71.7
Quantitative variables	**Mean ± SD**	**Min**	**Max**
Age (years)	26.87 ± 5.7	16	42
Spouse age (years)	31.12 ± 5.9	19	60

Analysis of correlations within the MEAVDQ dimensions revealed that, in Structure A, the strongest link existed between providing necessary information and mother interaction (r = 0.58). For Structure B, the dimensions most closely related were maternal health and the need for pain management (r = 0.59). In Structure J, the highest association was observed between ensuring mothers' requests are met and trust in the midwife (r = 0.35) **(Table 2).**

Table 2. Correlation between different dimensions of A, B, J in participants

Structure	Dimensions Compared	Correlation (r)	p-value
A	Mother's privacy – Provision of necessary information	0.49	<0.0001
	Interaction with mother – Provision of necessary information	0.58	<0.0001
	Interaction with mother – Mother's privacy	0.52	<0.0001
B	Fetal health – Midwife's role importance	0.50	<0.0001
	Maternal pain – Midwife's role importance	0.36	<0.0001
	Maternal stress – Midwife's role importance	0.57	<0.0001
	Maternal health – Midwife's role importance	0.39	<0.0001
	Mother's need for pain relief – Midwife's role importance	0.41	<0.0001
	Maternal relaxation – Midwife's role importance	0.54	<0.0001
	Maternal pain – Fetal health	0.38	<0.0001
	Maternal stress – Fetal health	0.58	<0.0001
	Maternal health – Fetal health	0.45	<0.0001
	Mother's need for pain relief – Fetal health	0.42	<0.0001
	Maternal relaxation – Fetal health	0.50	<0.0001
	Maternal stress – Maternal pain	0.29	<0.0001
	Maternal health – Maternal pain	0.45	<0.0001
	Mother's need for pain relief – Maternal pain	0.48	<0.0001
	Maternal relaxation – Maternal pain	0.38	<0.0001
	Maternal health – Maternal stress	0.44	<0.0001
	Mother's need for pain relief – Maternal stress	0.45	<0.0001
	Maternal relaxation – Maternal stress	0.51	<0.0001
	Mother's need for pain relief – Maternal health	0.59	<0.0001
	Maternal relaxation – Maternal health	0.32	<0.0001
	Maternal relaxation – Mother's need for pain relief	0.41	<0.0001
J	Trust in midwife – Meeting mother's requests	0.35	<0.0001
	Equal opportunities – Meeting mother's requests	0.04	0.50
	Trust in midwife – Equal opportunities	0.05	0.40

Regarding the association between demographic factors and the studied structures, women's educational level was the only variable that showed a significant relationship with structures A and B. For structure A, women with a college education had mean scores that were 8.29 points higher than those of illiterate women (95% CI: 2.52–19.9; p = 0.005). For structure B, women with education below a diploma scored 3.63 points higher than illiterate women (95% CI: 0.04–7.23; p = 0.04), and women with a college education scored 7.53 points higher than illiterate women (95% CI: 2.32–12.70; p = 0.005). No significant association was found between structure J and any demographic variable **(Table 3).**

Table 3. The correlation between demographic variables and structures

Variable	Category	A Coefficient	95% CI (A)	P-value (A)	B Coefficient	95% CI (B)	P-value (B)	J Coefficient	95% CI (J)	P-value (J)

Age	—	0.20	−0.22 to 0.63	0.34	0.24	−0.14 to 0.62	0.22	−0.24	−0.58 to 0.10	0.16
Gravidity	—	0.44	−1.12 to 2.07	0.60	0.83	−0.65 to 2.32	0.27	1.26	−0.07 to 2.58	0.06
Spouse age	—	−0.25	−0.64 to 0.14	0.20	−0.24	−0.59 to 0.11	0.19	0.07	−0.24 to 0.39	0.66
Educational status	Illiterate (Ref)	—	—	—	—	—	—	—	—	—
	Under diploma	2.36	−1.58 to 6.31	0.24	3.63	0.04 to 7.23	0.04	2.79	−0.42 to 5.90	0.09
	College education	8.29	2.52 to 13.9	0.005	7.53	2.32 to 12.7	0.005	4.33	−0.31 to 8.98	0.07
Job status	Housewife (Ref)	—	—	—	—	—	—	—	—	—
	Employee/Self-employed	−2.98	−6.79 to 0.18	0.12	−3.20	−6.58 to 0.34	0.08	2.03	−1.06 to 5.12	0.19
History of miscarriage/stillbirth/preterm	No (Ref)	—	—	—	—	—	—	—	—	—
	Yes	2.14	−0.87 to 5.15	0.16	0.89	−1.86 to 3.63	0.53	1.05	−1.39 to 3.50	0.39
Spouse education	Illiterate (Ref)	—	—	—	—	—	—	—	—	—
	Under diploma	2.21	−1.68 to 6.13	0.27	2.77	−0.77 to 6.33	0.13	−2.03	−5.21 to 1.13	0.20
	College education	−2.40	−8.03 to 3.23	0.40	0.91	−4.22 to 6.04	0.73	−1.64	−6.22 to 2.93	0.48
Spouse job	Unemployed (Ref)	—	—	—	—	—	—	—	—	—
	Employee	−3.65	−8.91 to 1.60	0.17	−1.56	−6.34 to 3.22	0.52	0.54	−3.73 to 4.81	0.80
	Self-employed	−2.60	−7.25 to 2.05	0.27	−2.62	−1.62 to 1.47*	0.22	−1.30	−5.08 to 2.48	0.50

Structural equation modeling (SEM) was applied using a model developed specifically for this study to analyze how the structures relate to one another. Chart 1 displays these outcomes, where both Pearson correlations and regression paths are illustrated. Among the dimensions linked to structure A, “interaction with the mother” demonstrated the strongest association (r = 0.84). For structure B, the dimension most closely connected was “mother’s stress” (r = 0.78). In the case of structure J, “trust in the midwife” showed the highest correlation (r = 0.92).

Table 4. The results of the SEM derived from the corresponding model in chart 1

Pathway	Effect Type	Standardized Estimate (95% CI)	t-value	p-value
A → B	Direct	0.77 (0.72–0.82)	31.3	< 0.0001
B → J	Direct	0.51 (0.33–0.67)	5.90	< 0.0001
A → J	Direct	0.16 (0.01–0.33)	2.01	0.04
A → J via B	Indirect	0.39 (0.26–0.53)	5.72	< 0.0001
A → J	Total	0.55 (0.48–0.63)	14.61	< 0.0001

The results also showed a significant and direct link between structures B and J, and structure A was connected to structure J through both direct and mediated pathways. Specifically, each one-unit increase in structure B corresponded to a 0.51-unit rise in structure J (95% CI: 0.33–0.67). Likewise, a one-unit increase in structure A produced a direct 0.16-unit increase in structure J (95% CI: 0.01–0.33). In addition to this direct influence, structure A also affected structure J indirectly through structure B, contributing an additional 0.39-unit increase (95% CI: 0.26–0.53). Notably, this mediated effect of A on J was larger than its direct effect **(Table 4).**

To evaluate how well the proposed model fit the data, a confirmatory factor analysis (CFA) was conducted for the model illustrated in **Figure 1**. Although the chi-square test was statistically significant ($p < 0.0001$), the chi-square-to-degrees-of-freedom ratio was 3.12, which is below the commonly accepted threshold of 5, suggesting adequate model fit. Additional fit indices supported this conclusion: the GFI (0.95), AGFI (0.92), and CFI (0.89) were all close to or above the recommended cutoff of 0.90. Moreover, the RMSEA value of 0.04 indicated a strong fit between the model and the observed data.

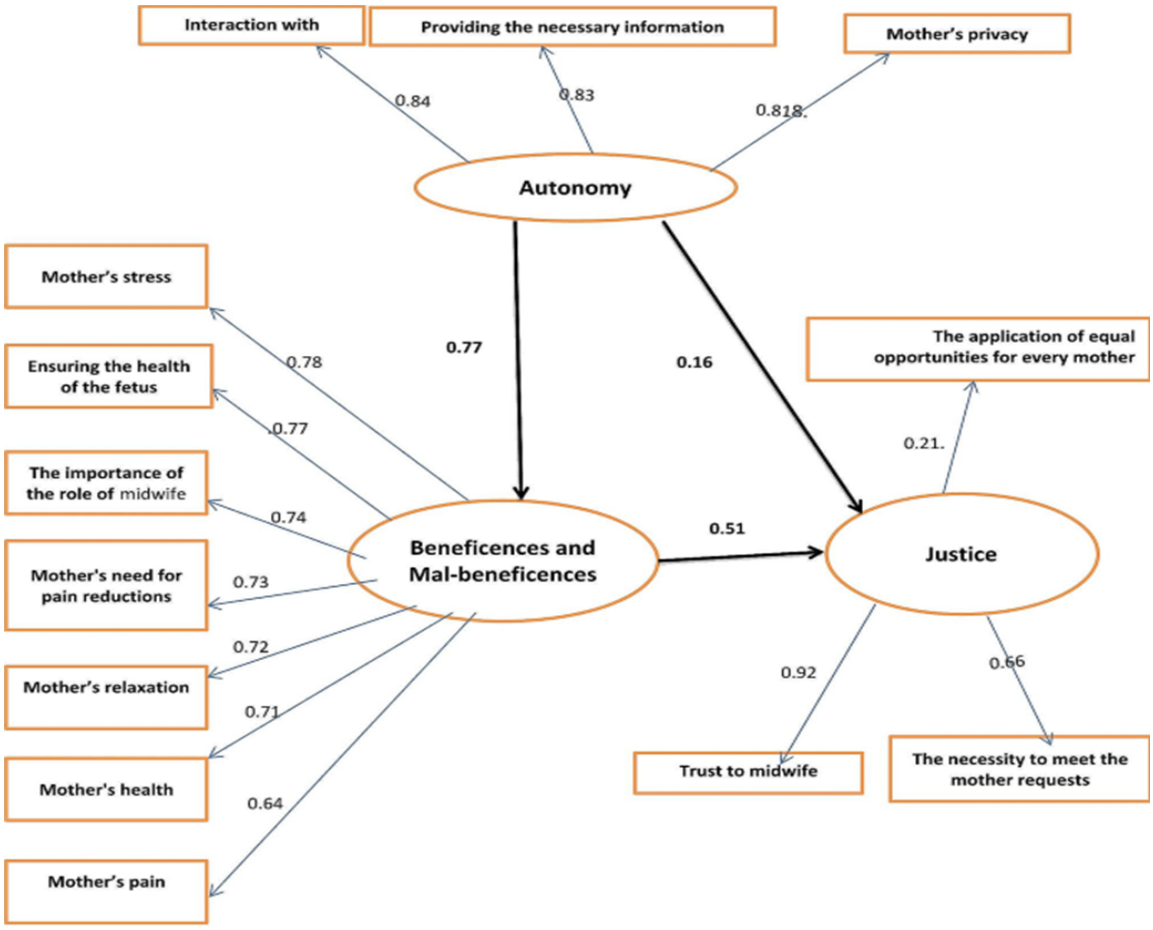

Figure 1. The structural model illustrating how Autonomy, Beneficence, Non-maleficence, and Justice are interconnected within the vaginal delivery subscales.

In this study, we evaluated the construct validity of the MEAVDQ using both structural equation modeling (SEM) and confirmatory factor analysis. In addition, we introduced a conceptual model that explains how core medical ethics principles interact during childbirth. The findings suggest that respect for autonomy functions as the central ethical principle in this context, as strengthening autonomy appears to enhance the practice of Beneficence, Non-maleficence, and Justice.

Previous research emphasizes that honoring a patient's autonomy is fundamental to the decision-making processes of clinicians, patients, and families. During conversations about treatment planning or care preferences, many clinicians begin by exploring the patient's views on autonomy. Physicians who prioritize patient self-determination are more inclined to respect their choices, whereas in other cases treatment decisions may be directed largely by the medical team. A recommended first step is asking whether the patient has completed an advance directive, which also helps clinicians understand the patient's motivations and preferences regarding autonomy in care decisions [19].

Patient characteristics such as age and race influence how autonomy is understood. Older individuals often prioritize goals of care rather than life-prolonging interventions, while younger patients may frame autonomy differently [20]. In the present study, however, age did not appear to shape women's perspectives on ethical principles in childbirth, likely because participants were generally young and clustered within a narrow age range. Cultural and ethnic differences have also been shown to affect perceptions of autonomy [20, 21], but our participants shared the same racial and ethnic background.

Educational level was associated with the first three ethical principles—autonomy, beneficence, and non-maleficence. Literacy can strongly influence an individual's health attitudes; a meta-analysis has shown that inadequate health literacy contributes to poorer health outcomes [22]. Our pathway model indicates that providing mothers with clear information and building positive relationships are fundamental to supporting autonomy. Delivering relevant and comprehensible information enhances autonomy by ensuring that women understand their choices during childbirth [9].

High-quality medical communication is essential for fostering a collaborative clinician–patient relationship that supports appropriate treatment decisions. Recent literature highlights the growing implementation of shared decision-making models [23, 24], which demonstrate that transparent discussions of treatment options strengthen agreement on care choices. When women are actively engaged in making decisions about their childbirth care, they regain a sense of agency and control. To support this, clinicians must recognize each patient's desired degree of involvement in decision-making [25].

This study also showed that efforts to manage and reduce labor pain reinforce adherence to the principles of beneficence and non-maleficence. Labor pain is often intense and can negatively impact both the mother and fetus [26, 27]. Providing pain relief upon the mother's request helps ensure that these ethical principles are upheld.

Clinicians are encouraged to understand and honor patients' preferences and personal goals for their care [20]. Justice in healthcare underscores the right of individuals to access services and to be fully included in decisions about their health [12, 28].

SEM path analysis supported these conceptual relationships. The first ethical principle (autonomy) exerted a direct influence on the second and third principles (beneficence and non-maleficence). These two principles also showed direct, significant associations with the fourth principle (justice). Moreover, autonomy was linked to justice through both direct and mediated pathways.

The central importance of autonomy in modern medical ethics is well documented; promoting patients' self-determination remains a key responsibility of clinicians and healthcare professionals [3, 29].

Limitations of the study

Findings from self-reported questionnaires may not precisely capture participants' true opinions. Additionally, since the study was carried out in a limited geographical region, caution is advised when extending or generalizing the results to other contexts, populations, or locations.

Conclusion

The findings of this study indicate that the instrument possesses adequate construct validity, making it appropriate for use in interventional research related to medical ethics in childbirth.

The results also highlight that the first ethical principle is the most influential in the childbirth context. Enhancing this principle leads to improvements in the other two principles, suggesting that interventions aimed at strengthening the first principle can, in turn, elevate the overall ethical practice in childbirth.

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Ethics Statement: This study was approved by the ethics committee of Kerman University of Medical Sciences (Reg. No. 96,000,327). After approval, a permit was issued to refer to the maternity ward of Hospital. The researcher verbally explained the study objectives to the participants reassuring them about confidentiality of data and that they could leave the study at any time at will, Also, written informed consent was obtained from participants. In case of adults who were illiterate, the researcher asked her questions and recorded her answers. All methods were carried out in accordance with relevant guidelines and regulations (declaration of helsinki).

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