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Comprehensive Analyses of Waterbirth Benefits for Mothers and Newborns

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ABSTRACT

A waterbirth reduces pain for mothers and newborns, shortens the second stage of labor, and leads to fewer neonatal respiratory problems and hospitalizations. However, its use in the U.S is limited. Because waterbirth use is impacted by midwives' attitudes, confidence, expertise, and perceived supports and barriers. A national survey of U.S. midwives and midwifery students was conducted to learn their attitudes toward waterbirths, their confidence levels and sources of competence, and their perceptions of support and barriers. Analyses are achieved using emails and questionnaires that are sent to 6352 active members of the American College of Nurse-Midwives. Each subscale had quantitative and qualitative questions that permitted quantitative analysis by SPSS 25.0- even for categorized qualitative data. 1001 surveys are initiated and 919 are completed by 804 midwives and 115 students, respectively. The most commonly identified barrier is 'lack of scientific evidence of safety and benefits of waterbirth' (44%), followed by 'unwelcoming environment' (by 37.3%). U.S. midwives show positive attitudes towards waterbirth, probably because waterbirth supports physiologic birth. Waterbirth is also reported to be a confident and competent experience by midwives. It is imperative to support waterbirth practices by accommodating patients' desires for a waterbirth. In order to help overcome this main barrier and experience the many benefits of waterbirth, further research is needed.

Keywords: *Midwives and student-midwives' attitude, midwives and student-midwives' confidence, midwives and student-midwives' competence, midwives and student-midwives' confidence, waterbirth perceived barriers, waterbirth perceived support.*

INTRODUCTION

Waterbirth is available to women predominantly at home, or in an out-of-hospital birth center, and homebirths abroad.6,16,25 The Midwives Alliance of North America Statistics Project reported that between 2004 and 2009, of the 18,343 women who gave birth at home or in a birth center, 6534 delivered their babies in water, 1573 intended to give birth in water but didn't, and 10,290 delivered their babies out of water.6 Snapp et al.37 reported that despite limited use of waterbirths in hospital settings due to safety concerns, waterbirth increased in home and birth centers. The American Association of Birth Centers (AABC) Perinatal Data Registry (PDA) of births between 2012 and 2017 (55,001 registered pregnancies) 45,195 women planned a community birth and 26,684 had community birth (16,432 land births and 10,252 waterbirths)37. Waterbirth is implemented becauseof its advantage s,i.e. empowerment,23,42,43 feeling in control,23,43 birth experience improvement,23,29,42,43 pain reduction, shortened second stage by 32 minutes, minimal spinal and epidural use, no harm to newborns nor mothers,11,20 less fetal distress, dystocia, genital lacerations, episiotomies, hemorrhage, and postpartum readmissions.37 Newborns of waterbirth were less likely to be transferred to critical care, admitted to intensive care unit, or suffer from respiratory problems, but they had some rare cases of cord avulsions.37 Based on these findings, Snapp et al.37 concluded that because land and waterbirth had similar positive maternal and neonatal outcomes, maternal choice forager birth should guide practice. Yet, waterbirth in the U.S.A. is not widespread due to fear of unsubstantiated risks.3,4

Evidence for Waterbirth

The benefits and safety of waterbirth for mother and baby are well documented.1,7,24,30,31,37,48 Infants born in water were less likely to have low Apgar scores, neonatal intensive care admissions, and post-discharge re-admission for up to six months than infants not born in water.6 The same findings were reported in a meta-analysis of 29 studies and found no differences in neonatal mortality for neonates born in or out of water.41 A systematic review of experimental, prospective observational, and retrospective studies, found that waterbirth does not pose any additional risks for poor neonatal outcomes in low risks women.12 A meta-analysis of 91 studies of neonatal outcomes with waterbirth concluded that waterbirth during the second stage controlled pain and didn't pose any negative neonatal outcomes.44 Women whose care included waterbirth had fewer transfers, fewer postpartum admissions, lower infection rates,6 and only a slightly increased risk for genital tract trauma/possibly due to enhanced urge to push.6, 33 Zhao et al.48 reported that waterbirths were associated with fewer episiotomies (confirmed by Snapp et al.37) and stronger pelvic floor muscles during postpartum.

Waterbirth risks have been suggested,33 i.e. maternal water embolism,31 neonatal drowning,30 neonatal hyponatremia, umbilical cord rupture, and death,39,32,33 but the evidence is weak,33 as it is for poor maternal and neonatal thermoregulation,32 infections,32,21 and neonatal water aspiration.32,36,47

Despite the predominance of advantages, U.S. medical associations resist waterbirth.3,4 In 2014, the American College of Obstetricians and Gynecologists (ACOG) and the American Academy of Pediatrics

(AAP) Committee Opinion Number 594 concluded that the only practice of waterbirth in the second stage of labor "should be performed within the context of an appropriately designed clinical trial with informed consent."3(p1) Because no evidence was available to support Opinion 59418 a subsequent opinion related that, until there is enough data to support second stage waterbirth safety and benefits, birth should occur on land, not in water.4

The main contributions are as follows

We report the results of a national study of midwives with waterbirth experience and midwifery students regarding their attitudes, confidence, competence, support, and barriers about waterbirth.

Various research questions are formulated. These are as: 1) What is the magnitude of midwives' attitudes about waterbirth? 2) What are midwives' levels and sources of confidence and 3) competence in conducting waterbirths? and 4) What supports and 5) barriers to waterbirth are perceived by midwives?

The study is guided by Theory of Planned Behavior (TPB) which posits that a person's intention to engage in a behavior is dynamically influenced by their attitudes, subjective norms, and perceived behavioral control.2

A modified version of Meyer et al. i.e. 'The Certified Nurse Midwife Waterbirth Survey' is used for survey.

Each subscale had quantitative and qualitative questions that permitted quantitative analysis by SPSS 25.0- even for categorized qualitative data.

The remaining paper is organized as: Section 2 presents the details about influence of attitudes, confidence, competence, supports, and barriers of midwives on waterbirth. Section 3 discusses the methods used in this paper.

Section 4 illustrates the results and answers of research questions. Section 5 presents the discussion along with limitations of the study. Section 6 concludes the paper.

Influence of attitudes, confidence, competence, supports, and barriers

This section presents the influence of attitudes, confidence, competence, supports, and barriers of midwives on waterbirth. These categories are also assessed by asking the questions from midwives through the survey. The subsequent sections present the details of these categories and their respective formulated questions.

Attitudes Towards Waterbirth

Nurses' attitudes are influenced by lack of training, negative cultural beliefs, and negative experiences which lead to an attitude of avoidance of waterbirth.34 Because patients rely on their provider's opinions and attitudes,19,45 midwives' attitudes towards waterbirth influence their patients' choice.9,19,37,45 Many midwives have positive attitudes towards waterbirth, advocating for, supporting, and perceiving waterbirth as a beneficial and safe practice.10,9,23,26, 28,43 About 64% of 53 midwives surveyed in Georgia's chapter of the American College of Nurse Midwives (ACNM) reported a strong-to-moderate emphasis on waterbirth in hospitals and community settings and their perceptions of benefits were higher than perceptions of limitations.26 A cross-sectional survey of 1476 midwives, 105 obstetricians, and 37 neonatologists revealed that midwives had more experience, knowledge, and positive attitudes towards waterbirth than physicians,43 and were willing to provide waterbirth if trained and supported by waterbirth protocols.43 A qualitative study showed midwives valued waterbirth more than medical staff.

27 Lewis et al.23 reported midwives enjoyed water birth's "instinctive birthing; woman-centered atmosphere; and undisturbed space."23 A qualitative survey of 233 midwives showed that midwives' attitudes reflected the "reality of the system", "authoritative others" and "pseudo-decision-makers."9 Risk-oriented maternity services, medical staff control, and restrictive guidelines limited midwives' and ability of women to make decisions regarding waterbirth.9

Waterbirth, as a non-pharmacologic pain intervention, is considered facilitation of physiologic birth26,35,43 "labor and birth powered by the inherent human capacity of the woman and the fetus in the absence of medical interventions."45 Advocating for and providing physiologic birth is a basic midwifery role.45,5 But midwives find advocating for physiologic birth, specifically waterbirth, challenging in light of medicalization of birth.9 Medicalization of parturition creates a negative attitude towards physiologic birth by obstetricians and midwives.19

Attitudes reflect the midwives' personal views, beliefs, intentions, feelings about waterbirth, and ways of behaving towards waterbirth. Attitude is assessed by asking midwives: 1) if they recommend waterbirth to their patients, family, and friends, 2) to advocate for waterbirth among their peers; 3) are willing to implement waterbirth policies, and 4) whether participation in waterbirth policies made a difference in numbers of waterbirths.

Confidence Regarding Waterbirth

Confidence is critically important in the provision of nursing14 and midwifery care.19,27,28,43,45 Midwives' confidence depends on positive experiences and exposure to physiologic births.45 Midwives' waterbirth confidence is threatened by limited experience, skills, and knowledge, in addition to lack of support by obstetricians and senior staff.

27 Russell et al.35 queried midwives before and four and eight months after a waterbirth workshop; 53 questionnaires were returned by midwives who did or did not have a waterbirth coordinator.35 Retained knowledge about, number of, and social support for waterbirth was higher in the coordinator group; confidence in waterbirth skills was similar between groups.35 Nicholls et al.28 found four themes related to waterbirth confidence in 26 midwives: 1) "previous personal values", 2) "attitude and knowledge", 3) "waterbirth education before practice", and 4) "confidence created by guidelines, experienced midwife support, adequate practice, and unlearning of old skills."28 In summary, education, experience, skills and training, written guidelines, and a supportive waterbirth culture help midwives have high levels of confidence in providing waterbirth.26,35,28,43 Confidence was measured by asking midwives' about knowledge resources, training, mentoring needs, physical capability, and self-reported confidence about waterbirth.

Competence in Conducting Waterbirth

Midwives need competence (knowledge and skills) about waterbirth43,47 in order to facilitate physiologic birth, ease labor pain, and improve coping.5,26,35,43 Competency in nursing is composed of behaviorism, trait, and holism.15 Behaviorism is the ability to perform core skills, trait means having the knowledge and critical thinking ability necessary to perform skills, and holism is a summary of knowledge, skills, attitude, thinking abilities, and values.15 The variations in exposure to and training for waterbirth among midwifery programs may lead to variations in waterbirth competence among midwives.26 A study of 29 waterbirth experienced midwives' competence, perception, education, knowledge, and practice of waterbirth, found that 90% had observed

waterbirths by midwives and 86% had attended waterbirths under supervision.23 Waterbirth competence was achieved by 93% of midwives after facilitating waterbirth, by 90% of midwives after participating in waterbirth training, and by 93% of midwives after attending seven waterbirths.23 Competence with waterbirth was defined as 1) the 'yes' or 'no' answer to the question "Are you certified in waterbirth?" as a measure of behaviorism, 2) the summary of 'yes' answers to 10 questions relating to different forms of knowledge acquisition (formal coursework, attending a conference, watching educational videos, and assisting other midwives who conducted waterbirth) as the measure of trait, and 3) the Likert Scale responses (1 = agree to 5 = disagree) to the stem "I am competent to provide waterbirth" as the measure of holism.

Support

Support means to encourage, enable, and help. Also, support is "anything which strengthens the individual's ability to function capably and to function to his or her satisfaction."46(p 118) In a scoping review of mechanisms of support for exclusive breastmilk expressers in the community, Strauch et al.40 defined formal and informal institutional support. Formal support means positive and useful programs, education, network, tools, and personnel,9,26,35,40 and informal support referred to personal networks, peers, websites, and blogs.40 In a study of midwives and waterbirth, Milosevic et al.27 reported that support includes the availability of resources (pools and monitoring equipment), supportive workplace culture and staff, less restrictive guidelines, patient interest in waterbirth, and midwives could proactively educate patients and provide waterbirth.27 Action research by Russell et al.35 confirmed patient-centered leadership provided strong social support to midwives and led to a perception of waterbirth as a desirable activity.

The study reported here examined these types of support for waterbirth by 1) Likert scale responses (1 = not supportive at all to 3 = strongly supportive) to seven questions "How would you rate (obstetricians, pediatricians, nurses, other midwives, administration, insurers, and patients) in your organization 2) Likert scale responses (1 = agree to 5 = disagree) to the stems "I need organizational and leadership support to offer waterbirth", "I need policies and guidelines to provide waterbirth", and 3) asking the midwives to "list all the sources of waterbirth support that are available for you".

Barriers

Identified barriers to waterbirth include lack of leadership, organizational support, midwifery autonomy to conduct waterbirth,27 strong evidence and global/local practice guidelines,13,28 and insurance coverage,37 and a medicalized workplace culture.27 A survey of 401 nurses revealed that institutional characteristics, rather than individual characteristics, were more associated with barriers to waterbirth.38 Thus, nurses who worked in hospitals identified more barriers to waterbirth than nurses working in midwifery-led facilities.38 Midwives practicing in hospitals are influenced by medical philosophy to meet required uniformity and unit routines in which the midwives have limited clinical autonomy.9,27,35 This study measured barriers by evaluating 1) Likert scale responses (1 = agree to 5 = disagree) to the stem a barrier to waterbirth implementation in your workplace is the "high cost", "lack of scientific evidence of safety/benefits", and "lack of skilled and confident providers." and 2) answers to "list all the barriers to waterbirth in your workplace."

METHODS

Design and Human Rights Protection

The descriptive study was exempt from review by the Case Western Reserve University Institutional Review Board. The electronic survey was emailed twice to 6352 Certified Midwives (CM's), Certified Nurse-Midwives (CNM's), and Student Nurse-Midwives (SNM's) members of ACNM, and ACNM's policy of soliciting members for research was followed. Electronic submission of the anonymous survey constituted consent and Survey Monkey encrypted the data and prevented access to respondents' addresses as human subject protection. The survey was allowed to be taken once from the same device and took about seven minutes to complete.

Sample

Sample of the 6352 recipients, 1001 opened the survey . after answering inclusion questions only 961 surveys were submitted, indicating a 96% response rate. Forty-two incomplete or partially complete surveys were excluded from analyses, leaving a final sample of 919 surveys for analysis. Respondents were either eligible to practice midwifery (n=804, 87.5 %) or were enrolled as midwifery students (n=115, 12.5 %) in accredited programs.

Tools

Participants' views of waterbirth were measured with the Modified Certified Nurse Midwife Waterbirth Survey (MCNMWS), composed of seven demographic and 40 waterbirth items. To address study variables, the survey was modified, with permission, from Meyer et al.'s26 'Certified Nurse Midwife Waterbirth Survey'.

Demographic items included participants' age, certification, education, years of experience, and practice setting, or midwifery student status in their midwifery program. The 40 waterbirth items formed five subscales: I. Attitudes (five Likert questions), II Confidence (one multiple choice, two yes/no, and four Likert questions), III Competence (10 yes/no and one Likert questions), IV Support (one open-ended and10 Likert questions), and V Barriers (one open-ended and three Likert questions) (Appendix 1). Content validity and clarity of the MCNMWS were established by four practicing midwives in a large mid-western city. Internal consistency reliability could not be established because some questions had only yes/no answers.

Procedure

All ACNM members received an email containing study details and a link to the survey. One week after the initial email, a follow-up reminder was sent. A participant could be excluded if they didn't meet the inclusion criteria. There were three options available for selecting the best answer to ensure adherence to inclusion criteria: 'I am currently eligible to practice midwifery in the United States', 'I am currently enrolled in an ACME accredited midwifery program', or 'none of the above'.

Analysis

The study was conducted using SPSS 25.0. SPSS generated mode and frequency for categorical and nominal variables (yes/no answers). We analyzed Kliert scale data as continuous data using frequency, percentages, means, and standard deviations. One 'select all that apply' question was included in the Confidence subscale. Responses of 'NA' were included in the analyses.

Data missing from the analysis were excluded. Content analysis of quantitative data and questions that had "Other, specify" was used to reveal codes aggregated into categories based on frequency.

RESULTS

Demographic Results

Among the 960 submitted surveys, 42 incomplete surveys were excluded from analysis, and 919 were analyzed. Eight-hundred and four (87.5%) were midwives eligible to practice in the U.S., and 115 (12.5 %) SNMs were enrolled in midwifery programs. Participants who were 40-59 years old were the largest group (n=376; 40.9%). Of the midwives, 85.6% were CNM and 1.8% were CM. Most (70.5%) of the participants had MS/MSN degrees. The majority (66.3%) were employed in a hospital setting. Thirty-nine (33.9%) students were in the first and 44 (38.2%) in the second year of study. Six-hundred and thirty-seven of the 804 (79.2%) responding midwives had experience conducting a waterbirth (see Table 1).

TABLE 1. Frequency and Percentage Summaries of Responses on Demographics (N=919)

Characteristics	Value
Age n (%)	
20-39	308 (33.8)
40-59	376 (40.9)
60 or older	193 (21.0)
Certification n (%)	
Midwife	804 (87.5)
Women's health/family nurse practitioner	135 (14.7)
The highest degree ever earned n (%)	
Masters	662 (79.9)
Doctorate	102(12.3)
Years of practice as a Midwife n (%)	
Less than 10	358 (37.3)
10-20	181(19.7)
20-30	183 (19.9)
More than 30	85 (9.2)
Midwifery student's n (%)	
first year in midwifery program (out of 115 students)	39 (33.9)
Second-year in midwifery program (out of 115 students)	44 (38)
Third-year in midwifery program (out of 115 students)	27 (23.4)
NA (out of 919)	683 (74.3)
Missing (out of 919)	125 (13.6)
Type of facility you practice in n (%)	
Hospital	609 (66.3)
Community clinic	157 (17.1)
Academic stings	125 (13.6)
Birthing center	126 (13.7)
Homebirth practice	85 (9.2)

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Research Question 1

Among the 74% who answered the attitude questions, many (46.3%) had positive attitudes towards waterbirth, the participants always (n=59; 6.4%), often (n=200; 21.8%), or sometimes (166; 18.1%) recommend waterbirth to patients, and often (n=233; 25.4%) or sometimes (271; 23.6 %) recommend waterbirth to friends and family. Nearly 20% (n=179; 19.5%) reported they advocated for a waterbirth at their workplace with 40% reporting that always (n=228; 24.8%) or often (n=146; 15.9%) participating in developing workplace policy made a difference in decisions for waterbirth. Most (n=546; 59.4%) would implement adopted waterbirth policies.

Research Question 2

The majority of respondents agreed (n=487; 53%) or somewhat agreed (n=155; 16.9%) they were confident that they had the required skills and knowledge and physical capability (agreed [n=712; 77.5%]) to provide waterbirth. More than half agreed (n=242; 26.3%) or somewhat agreed (n=242; 26.3%) on the need for formal training to develop confidence with waterbirth, and that a midwife mentor (agreed [n=347; 37.8%] or somewhat agreed [n=166; 18.1%]) helped build confidence and was the health professional they would go to for knowledge (n=782; 85.1%). In regards to formal training needed to build confidence, midwives related that education would be sought from academic journals (n=703; 76.5%), conferences (n=546; 59.4%), and professional websites (373; 40.6%) because less than half (n=445; 48.4%) were taught about or attended (n=308; 33.5%) waterbirth during their education.

Research Question 3

The respondents agreed (n=469; 51%) or somewhat agreed (n=137; 14.9%) they were competent to provide waterbirth, even though120 (13.1%) were certified waterbirth providers. To build competence with waterbirth the respondents had read a scholarly article/ research paper (n=721; 78.5%), watched a video (n=791; 86.1%) about labor in water or a video about birth in water (n=798; 86.8%). Less than half of midwives (n=324; 35.3%) reported continuing education or other formal training (n=295; 32.1%) on waterbirth, whereas 88.9% (n=817) had helped women labor in water, had witnessed a waterbirth (n=674; 73.3%), or had helped deliver a baby in water (n=637; 69.3%). Of the respondents, 93 (10.1%) had personally given birth in water.

Research Question 4

The participants indicated patients were either strongly (n=409; 44.5%) or mildly (n=414; 45%) supportive of waterbirth, and other midwives were strongly (n=457; 49.7%) or mildly (n=248; 27%) supportive. Labor and delivery nurses were mildly (n=400; 43.5%) or strongly supportive (n=149; 16.2%) of waterbirth, and about 20% of the respondents described pediatricians as mildly (18.5%) or strongly (2.2%) supportive of waterbirth, while 44.3% described pediatricians as not supportive at all of the waterbirth. Some respondents viewed their administration as mildly (n=213; 23.2%) or strongly (n=143; 15.6%) supportive, while the remainder viewed their administration as not at all supportive of waterbirth (n=341; 37.1%). Insurers were viewed as not supportive at all (n=260; 28.3%), or mildly supportive (n=137; 18.8%); the remaining 40% of respondents answered 'not applicable'.

Organizational support (69.6%), leadership support (70.8%), and policies and guidelines (75.4%) were respectively considered as the support needed for waterbirth. Sixty-five percent of participants replied to the open-ended question. The analysis yielded twelve categories of waterbirth support: patients, national midwifery associations, guidelines for home birth and birthing centers, hospital policies where waterbirths were allowed, independent midwives in private practices (source of the largest support [47.7%]), insurers, management, medical staff (obstetricians, pediatricians, or anesthesiologists), nurses, and research purposes were categories of support.

Research Question 5

The most common barrier to use of waterbirth was the lack of scientific evidence of the safety/benefits of waterbirth (44%). Almost half of the midwives did not agree that lack of skilled and confident waterbirth providers is a barrier (44.6%) and high cost was also not identified as a barrier (63.8%). Respondents wrote in the following barriers: an unwelcoming environment (37.3%), disapproval by ACOG and obstetricians, pediatricians, and anesthesiologists (33.2%), added workload of maintaining and cleaning tubs (22.3%). Less frequently written barriers were: waterbirth conducted for research only, lack of administrative support, challenging body mechanics, personal dislike of waterbirth, lack of hospital policy, lack of evidence of waterbirth effects, lack of workplace training, patients' lack of interest, and safety concerns.

DISCUSSION

The MCNMWS was completed by 919 U.S.-based practicing or student midwives and measured attitudes, confidence, competence, perceived supports, and barriers about waterbirth. Consistent with Meyer et al.26 demographics, age group 40-59 was the largest, majority had 20 years of experience or less, and most of the respondents worked in hospital settings. But unlike Meyer et al.'s26 this study included CNMs, SNMs, and CMs.

The respondents showed strong advocacy and positive attitudes towards waterbirth within their work environments. These positive attitudes were similar to Meyer et al.'s26 U.S. findings and international midwives'.9,10,23,28,43 The midwives recommended waterbirth to their patients, friends, and family, advocated for waterbirth, and were eager to implement waterbirth policies despite the expectation of dim views due to the negative culture,19,34 lack of training,27,34 and lack of evidence.34 The positive attitudes of U.S. midwives may be explained by waterbirth labor pain reduction and support of physiologic birth.26,35,43

The participants were confident they had the required skills, knowledge, and physical capability to provide waterbirth. Midwives' confidence was fostered by midwifery education about physiologic birth and waterbirth similar to the findings of Nicholls 28 and Wong et al.45

Competence in providing waterbirth was reported by more than half of the respondents, even though the majority were not certified waterbirth providers. The respondents participated in self-education as did the midwives in Meyer et al.'s26 study, possibly contributing to the large numbers of midwives who reported competence. Midwives' competence is related to labor pain control and patient coping improvement core midwifery tasks supported by waterbirth.5,26,35,43 Formal training and mentorship in waterbirth are competence-building activities identified by respondents and are congruent with Milosevic et al.27 findings that lack of training and midwifery mentorship led to lower competence and decreased rates of waterbirth.

The midwives perceived the strongest support from other midwives and patients, a finding similar to Meyers et al.'s26 respondents. Wiedenbach46 related personal and organizational support were facilitators of practice change. But waterbirth could be limited in organizations with restrictive guidelines and policies and personnel with negative attitudes and such was the case reported by Milosevic et al.27 as well as the data reported herein which medical staff, administrators, and insurers were viewed as non-supportive of waterbirth.

Like other nurturing interventions such as skin-to-skin contact,8 Lack of documented safety and benefits of a waterbirth was the main barrier to waterbirth, the same barrier was identified by Nicholls et al.28 too. Unwelcoming environment, medical disapproval, and professional organizations resistance were barriers reported by respondents to confirm the joint statements about waterbirth made by ACOG and AAP.3,4 Similar to previous findings,9,27,35 the respondents indicated that a medicalized environment and lack of midwives' autonomy were barriers to conducting waterbirth. Lack of confident waterbirth providers and costs of waterbirth was not perceived as barriers by midwives similar to the findings of Russell et al.35 and Wong et al.45

Limitations

Missing responses could have influenced the analyses and the results should be viewed with caution due to self-reporting which introduces subjective and potentially biased data. To reduce the self-reporting bias, the study purpose was explained in the introductory email. Due to non-response errors common to survey studies,17 representativeness of the sample may have been limited by possible participants not receiving notice of the study. Finally, financial constraints limited us to one thousand responses.

Implications for Practice

Although the respondents indicated that they had positive attitudes towards waterbirth, they believed that formal training in waterbirth should be provided in midwifery education and at work in order to establish confidence and competence. Therefore, midwives should receive more waterbirth training and certification in midwifery education. In order to increase waterbirth practices, guidelines, leadership support, and collaboration with medical organizations were seen as unmet needs.

Implications for Midwifery Education

Formal education and mentored and supervised opportunities to practice waterbirth are needed in initial midwifery and continuing education programs.

CONCLUSION

In this study, midwives in the United States responded to a questionnaire about their attitudes, confidence, competence, sources of support, and barriers to waterbirth. While few support and numerous barriers prevented midwives from providing waterbirth, they recommended and advocated for this method of delivery, helped develop waterbirth policies, and eagerly implemented these policies. With midwifery education, mentorship, and autonomy, midwives' confidence and competence with waterbirth reflected their core competency in pain control. A sufficient amount of data exists to support and enhance the use of waterbirth and reduce barriers.

In near future, for better analyses statistical and deep learning-based models49,50,51 will be used. Besides experiments can be performed by collecting the greater number of samples.

Supplementary Description

Appendix 1, The modified certified nurse midwife waterbirth survey

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