



## Short Communication

## Occupational Risks in Midwifery: From Bernardino Ramazzini to Modern Times

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## ABSTRACT

Occupational risks are often underestimated in midwifery. It is not commonly known that occupational risks were originally described by the Italian physician Bernardino Ramazzini (1633–1714) at the beginning of the 18th century. Our aim was to describe occupational risks in midwifery from Ramazzini to modern times. The original text by Bernardino Ramazzini was analyzed. A review of modern scientific articles on occupational risks in midwifery was conducted. Ramazzini identified two major occupational risks in midwifery: infections and awkward postures. Modern literature seems to agree with his considerations, focusing on infection, use of universal protection and personal protective equipment, and musculoskeletal problems. Modern studies also evidenced posttraumatic stress disorder that was probably postulated by Ramazzini himself. The poor number of articles in literature on midwives' occupational risks shows a lack of interest toward this issue. Prevention should therefore be emphasized in this field, so high-quality studies on occupational risks in midwifery are needed.

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## 1. Introduction

Occupational risks are often underestimated in hospitals and, particularly, in attendance at labor and in postpartum care. Indeed, there are very few studies on work-related risks among midwives even though they are continually exposed to a biological risk and they could suffer from musculoskeletal disorders (MSDs) and psychological distress.

It is not commonly known that Bernardino Ramazzini (1633–1714) first described occupational risks of midwives at the beginning of the 18th century. Ramazzini was one of the most important figures of Italian academic world in that period; he was appointed as Chair of Theoretical Medicine at the University of Modena and then Chair of Practical Medicine at the University of Padua, one of the most important universities in Europe at the time. Ramazzini authored a treatise on the diseases of workers (*De Morbis Artificum*, Modena, 1700), in which he first listed work-related health problems in different occupations [1–3]. A more complete edition of the treatise was published in Padua in 1713. In 65 chapters, the Italian physician combined his own experience and knowledge of

classical authors in analyzing, among the others, the effects of chemicals, dusts, repetitive motions, and awkward postures on the health of different classes of workers. Chapter 19 of *De Morbis Artificum* focuses on the diseases of the midwives (*de obstetricum morbis*). In this section, Ramazzini confirmed the interest on the work-related health risks in pregnancy, labor, and delivery which he had shown in his *Relazione sopra il parto e la morte della Ill.ma signora marchesa Martellini Bagnesi* (*Report on Marchioness Martellini Bagnesi's birth and death*), written in Modena in 1681 [1].

## 2. Bernardino Ramazzini and the diseases of midwives

Ramazzini first evidenced that midwives could be exposed to occupational risks even though serious diseases did not seem to afflict them more than other workers [1]. The Italian physician stated that these risks were related to “uterine discharge that flows with such abundance from the womb together with the infant” [1]. Uterine bleeding was believed to have malignant and poisonous qualities, as demonstrated by the evidence that the sudden suppression or diminished flow of the lochia led to a woman's death. At

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that time, the menstrual flow was also considered dangerous, even if some authors, such as Gabriele Falloppio (1523–1562), contested these theories. Ramazzini believed that menstrual blood could have noxious features because it was the result of an unspecified fermentation in the uterine glands. To corroborate those theories, Ramazzini explained that surgeons did not use swathes made from women's linen or nightgowns to treat wounds because of the poisonous nature of menstrual blood. The uterine bleeding that preceded and followed childbirth was considered more poisonous and virulent than menstrual blood because suppression or reduction of postpartum flow caused malignant fevers and death in women.

Another occupational risk evidenced by Ramazzini was awkward postures. In particular, the Italian physician reported that in other European countries, women in labor gave birth lying down in their beds, whereas in Italy, it was a common practice that they gave birth on hollow seats. For this reason, Italian midwives had to spend hours on their knees with their hands outstretched to receive the infant. In addition to the possible inhalation of harmful and unpleasant smells emitted by the postpartum discharge, Ramazzini stated that this task exposed midwives to diseases caused by the postpartum flow falling onto their hands. It could both inflame and ulcerate hands because of its corrosive nature. Ramazzini also mentioned that a midwife underwent her hand amputation because of a gangrene she contracted while assisting a syphilitic woman. Actually, those lesions were likely caused by a superinfection of preexisting small cuts or wounds on midwives' hands.

Considering the poor hygiene conditions of the past, both in rural areas and cities, it does not come as a surprise that even common germs of the vaginal flora could infect the skin of hands, weakened by hard work. Syphilis was treated separately as it was one of the most common sexually transmitted infections of the period. Aware of the possibility of syphilis transmission via direct contact after touching the postpartum discharge of a syphilitic woman, midwives used to protect themselves by covering their hands in linen swathes and by washing them in water and vinegar.

At the end of his dissertation, Ramazzini stated that there was no remedy to help midwives to carry out their profession without danger, other than washing their hands, arms, and faces and rinsing mouths with water, wine, or vinegar whenever they could and putting on clean clothes once they are back home.

### 3. Modern occupational risks in midwifery

Ramazzini identified two major occupational risks in midwifery: infection transmission and awkward postures. He was a pioneer in suggesting to use swathes and hand washing to prevent infections. Nowadays, the susceptibility to infective diseases is to be considered rare in developed countries. The decrease of the risk is attributable to lower incidence of severe infectious diseases such as syphilis and gonorrhoea, the acknowledgment of the importance of the use of protective devices and more attention to hygiene, as indicated by Ramazzini. However, the frequency of skin contact with blood or amniotic fluid, face-splashes, and needlestick injuries is still too high, representing major risk factors of infection in assisting HIV-positive women. Loewen et al [4] interviewed more than 1,700 certified nurse midwives (CNMs) and documented alarming data: 65% reported being soaked to the skin with blood or amniotic fluid, and only 55.1% reported using universal precautions (UPs).

The importance of UP is also highlighted by Panlilio et al., [5] who tried to characterize blood and amniotic fluid contact sustained by obstetric personnel during births through the analysis of 202 vaginal births and 468 caesarean sections. They observed that

blood and amniotic fluid contact was more frequent during caesarean section (50%) than during vaginal birth (39.1%) and that blood contact was more frequent than amniotic fluid contact [5]. Most blood and amniotic fluid contacts reported in the study were cutaneous although percutaneous injuries (i.e., needle sticks or cuts with other sharp objects) and mucous membrane contacts were recorded as well. Because blood and amniotic fluid contact can be an important route of infection, strategies to minimize the risk of occurrence should be developed.

The risk of HIV transmission should also be mentioned. While several data are now available about the incidence rate of seroconversion after exposure to HIV-infected blood, there is little knowledge about the consequences of contact with infected amniotic fluid: HIV has been isolated from amniotic fluid of HIV-infected patients, but data regarding seroconversion rates after occupational exposure to amniotic fluid from HIV-infected women are not available. Despite the acknowledgment of potential risks and the possibility to screen seropositive women in advance, the only way to reduce the incidence rate of infections is the use of protective devices, as confirmed by Panlilio's work: Almost half of the contacts sustained by midwives might have been prevented using fluid-resistant gowns, elbow-length gloves, face shields, and head hoods during births.

Although recent data are not available, the importance of adherence to universal precautions—already proposed by Ramazzini—is still valid, and strategies should be developed to increase their use and minimize the frequency of adverse exposures, while maintaining a caring midwife–woman relationship. However, the use of gloves can potentially cause dermatitis. A study conducted on 835 midwives in Japan evidenced that 41% reported experience of occupational dermatitis, 26% associated the dermatitis with medical glove use, and 2% had a diagnosis of latex allergy [6]. In detail, more than 30% of respondents wore gloves only when patients had an infectious disease, evidencing underuse of gloves and other UPs [6].

In regard to the second occupational risk evidenced by Ramazzini—i.e. awkward postures—midwives, as well as nurses, are at higher risk for MSDs. In their pioneering study, Long et al [7] determined the prevalence of neck musculoskeletal symptoms and upper back musculoskeletal symptoms in 1,388 Australian midwives. Their results indicated annual prevalence rate of nearly 50% for neck musculoskeletal symptoms and nearly 30% for upper back musculoskeletal symptoms.

Although much has been written about the possibility to reduce the incidence of MSDs through the development of safe patient-handling programs for acute care hospitals, there is little knowledge about such programs for labor and delivery or other maternity and newborn units. The reduction of MSDs among midwives should be a priority not only to alleviate individual pain but also to decrease workplace costs. A cross-sectional study on 729 practising midwives published by Long et al [8] showed that 20% of the study sample had taken sick leave for severe pain and functional incapacity due to work-related MSDs.

No evidence-based or opinion articles related to caregiving and task-related employee injuries in labor and delivery units are available, except for a study by Stichler et al. which showed a high potential for musculoskeletal injuries in these units [9]. Midwives manage heavier-than-average patients, help moving and repositioning patients after epidural anesthesia, transfer patients from the bed to the operating room table, or help placing patients' legs into stirrups for birth and adjusting the height and angle of the stirrups. They often have to hold awkward positions for a prolonged time and perform tasks that could increase the potential for injury, such as listening for heart tones, performing vaginal examinations, keeping the fetal head off the cord in cord prolapse, and assisting

with epidurals. As many tasks represent a risk because of the frequency of their performance, the exertion required, and the potential of injury, strategies to increase awareness on workplace safety should be developed as a priority. It is interesting to note that a recent systematic review on risk factors and functional consequences of work-related upper quadrant MSDs in midwives, nurses, and physicians did not evidence studies of midwives, suggesting the need for high-quality studies in this population [10].

Finally, Ramazzini seems to mention a modern occupational hazard: psychological distress. The Italian physician claimed that “they exhaust themselves to such an extent (especially when assisting the wives of the wealthy and when labor is particularly difficult) that, when it is over, they return home exhausted and worn-out, cursing their profession”. Job stress, physical exhaustion, burnout, and PTSD can be evidenced in midwives, as highlighted by Leinweber et al [11] in their study on Australian midwives. PTSD symptoms among midwives may have important implications specific to midwifery practice, such as a reduction in empathic abilities and an emotionally distant care that may contribute to feelings of being unsupported among women during labor and delivery. The risk to develop PTSD is associated with personal and trauma event–related factors. A personal traumatic experience when giving birth and exposure to birth trauma, including death or severe injury of mother or baby and abusive or suboptimal care, increase midwives’ vulnerability to the adverse psychological impact of witnessing birth trauma [10]. The risk of developing PTSD after a current trauma experience is even higher in case of previous traumatic experiences, such as childhood abuse or prior events involving interpersonal violence. However, prior traumatic exposures are neither sufficient nor necessary for midwives to develop PTSD but may induce personal vulnerability to PTSD occurrence. Acute reactions of horror and guilt when witnessing a birth trauma also increase the risk for PTSD. Because the development of PTSD among midwives undermines their empathy for women and is associated with an increased likelihood of an intention to leave the profession, strategies to achieve a reduction in birth trauma incidence should be set to reduce peritraumatic reactions of horror and feelings of guilt and reduce the possibilities for partnership.

#### 4. Conclusion

At the beginning of the 18th century, Bernardino Ramazzini first evidenced the importance of preventive measures in midwifery. In particular, the approach of the Italian physician appears to be innovative: he interviewed the midwives themselves, who could evidence their own health problems and suggest remedies. It should be noted that the introduction of preventive measures and the improvement of hygienic standards (hand washing and use of gloves) proposed by Ramazzini could

protect not only the midwives but also the pregnant women against infection transmission.

Finally, although the first historical reference on the importance of prevention of midwives’ occupational risks was Ramazzini’s work, dating back three centuries ago, the poor number of articles and studies in modern-day literature shows a lack of interest in this topic. During their practices, midwives seem to underestimate their hazards; gloves and other appropriate personal protective equipment are not commonly used because they are often considered a barrier between midwives and women. Preventive measures should therefore be emphasized, and attention should be paid not only to musculoskeletal diseases and infections but also to the risk of mental and physical distress caused by night shifts and by traumatic events during births.

#### Conflicts of interest

The authors have no conflicts of interest to disclose.

#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.shaw.2018.11.002>.

#### References

- [1] Carnevale F, Mendini M, Moriani G, editors. Bernardino Ramazzini. Medical and physiological works. Caselle di Sommacampagna (Verona). Cierre Edizione; 2009.
- [2] Galimberti E, Manzini F, Riva MA. Bernardino Ramazzini (1633–1714): an often forgotten pioneer in maritime health. *Int Marit Health* 2014;65:41.
- [3] Riva MA, Belingheri M, De Vito G, Lucchini R. Bernardino Ramazzini (1633–1714). *J Neurol* 2018;265:2164–5.
- [4] Loewen NL, Dhillon GL, Willy ME, Wesley RA, Henderson DK. Use of precautions by nurse-midwives to prevent occupational infections with HIV and other blood-borne diseases. *J Nurse Midwifery* 1989;34:309–17.
- [5] Panlilio AL, Welch BA, Bell DM, Foy DR, Parrish CM, Perlino CA, et al. Blood and amniotic fluid contact sustained by obstetric personnel during deliveries. *Am J Obstet Gynecol* 1992;167:703–8.
- [6] Sasaki M, Kanda K. Glove selection as personal protective equipment and occupational dermatitis among Japanese midwives. *J Occup Health* 2006;48:35–43.
- [7] Long MH, Johnston V, Bogossian FE. Helping women but hurting ourselves? Neck and upper back musculoskeletal symptoms in a cohort of Australian Midwives. *Midwifery* 2013;29:359–67.
- [8] Long MH, Bogossian FE, Johnston V. Functional consequences of work related spinal musculoskeletal symptoms in a cohort of Australian midwives. *Women Birth* 2013;26:e50–8.
- [9] Stichler JF, Feiler JL, Chase K. Understanding risks of workplace injury in labour and delivery. *J Obstet Gynecol Neonatal Nurs* 2012;41:71–81.
- [10] Long MH, Johnston V, Bogossian F. Work-related upper quadrant musculoskeletal disorders in midwives, nurses and physicians: a systematic review of risk factors and functional consequences. *Appl Ergon* 2012;43:455–67.
- [11] Leinweber J, Creedy DK, Rowe H, Gamble J. A socioecological model of post-traumatic stress among Australian midwives. *Midwifery* 2017;45:7–13.