

Estimating Midwifery Staffing Needs in a Maternity Ward Using the Workload Indicators of Staffing Need (WISN) Method

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Abstract

Introduction: Achieving optimal quality and efficiency in the global health system requires balancing the workload of healthcare providers, particularly in resource-limited settings. Midwives, as essential healthcare professionals, play a significant role in improving maternal and neonatal health outcomes. **Objective:** This study aimed to estimate the required number of midwives and evaluate their workload pressures in a maternity ward using the WISN Method. **Methods:** A cross-sectional descriptive study was conducted in 2021 among midwives in five departments of a specialized hospital. **Results:** Midwives at Batna Maternity Hospital accounted for 29.24% of the paramedical staff and 15.36% of the total workforce. The annual available working hours for midwives were 1367.53 ± 172.01 hours. In the delivery room, they allocated almost 81% of their available working time to basic activities, while the remaining time was dedicated to additional, categorical, or individual activities. The required number of midwives for these activities exceeded the available staff in four out of five units, resulting in a WISN ratio of 0.9 and a shortage of three midwives. The WISN ratio ranged from 0.83 to 1.12, indicating that these units had 83% to 112% of the necessary midwives, with the lowest ratio observed in the delivery room and the high-risk pregnancy service, facing the highest workload pressure. **Conclusion:** Workload pressures vary among different healthcare services, even within the same staff category. This highlights the importance of considering work processes, activity standards, and workload pressure when determining staffing needs.

Keywords

WISN, Staffing Levels, workload, activity, midwife.

1. Introduction

The goal of optimizing human resource management in healthcare facilities often leads to an increased workload for nursing staff, which can have negative impacts on their physical and mental health, as well as the quality of care provided. In order to address this issue, the present study aims to specifically evaluate the workload and staffing levels among midwives in five departments of the maternity ward at the Specialized Hospital Establishment (SHE) of Batna in Algeria. The Algerian healthcare system faces challenges in terms of budgetary and human resource management, with disparities in infrastructure and medical personnel within the country. The study utilizes the Workload Indicators for Staffing Need (WISN) methodology developed by the World Health Organization to analyze the current workload and estimate midwifery-staffing requirements in this particular hospital setting. The findings of this research will provide important insights into the working conditions of midwives at the Batna SHE and can help guide decision-makers in allocating human resources for reproductive health in a way that reduces workload and promotes the well-being of caregivers.

1.1 Objectives

The main objective of this study is to assess the midwives' workload in the maternal and child healthcare institution of the Batna district using the Workload Indicators of Staffing Needs (WISN) method developed by the World Health Organization. This evaluation will determine the optimal number of midwives required to meet the workload demand within this institution.

2. Literature Review

The scarcity of healthcare professionals, particularly midwives, is a pressing global issue that poses significant challenges to healthcare systems in over 90 countries worldwide. According to the International Labour Organization, the average number of health workers per 10,000 population is 34.5, leaving approximately one-third of the global population without adequate access to healthcare services due to workforce shortages. The Global Strategy on Human Resources for Health: Workforce 2030 predicts that the global deficit of skilled health workers will reach approximately 10 million by 2030 (WHO, 2016).

In low- and middle-income countries, the shortage of healthcare workers, especially midwives, has become a major public health concern. Sub-Saharan African countries, for instance, face a severe shortage of 1.5 million health professionals, which significantly impacts maternal and perinatal mortality rates (WHO, 2016). Numerous empirical studies have demonstrated the negative repercussions of inadequate staffing on perceived workload and the quality of care, highlighting the importance of dynamically adjusting workforce levels to meet the healthcare needs of patients (Goetz et al., 2022).

The Workload Indicators of Staffing Need (WISN) method has proven successful in various low- and middle-income countries, such as Ghana, Botswana, Kenya, and Tanzania, in streamlining workforce planning and management, particularly in maternal health. By applying the WISN method in maternity units, it becomes possible to estimate the staffing requirements for midwives, optimize their allocation and working conditions, and ultimately enhance the quality and safety of care (Kunjumen et al., 2022).

Efficient workload management is crucial for countries and institutions to deliver high-quality services, retain employees, and decrease turnover rates. The "Global Strategy on Human Resources for Health: Workforce 2030" provides guidance on workforce strategies for low- and middle-income countries (LMICs) and references studies that examine workload issues. These studies offer valuable insights into the current state of workload within healthcare systems, the coping strategies employed by staff to deal with excessive work pressure, the causes of heavy workloads, and potential solutions.

The WISN method, developed by the World Health Organization in 1998 and updated based on implementation experiences in various countries, is a straightforward, useful, and time-efficient approach. It expresses the results as differences and ratios, with the former indicating personnel shortages or surpluses, and the latter reflecting the

workload pressure experienced by staff members. Compared to other methods, the WISN approach is simple to use, operate, apply, comprehensive, and realistic.

However, the WISN method has some limitations. Challenges in data collection and the failure to consider mental workload and teamwork are among the identified issues, resulting in a predominantly quantitative perspective (Dussault et al., 2003). Ongoing efforts are being made to refine and adapt the WISN method to the specificities of maternity services (Souza et al., 2015). Methodological adaptations are required to account for variable workloads, continuous presence requirements, and activity peaks related to childbirth.

Studies conducted in various low- and middle-income countries have revealed significant shortages of midwives, as indicated by WISN ratios below one (Asres et al., 2023). Further research is necessary to understand the organizational factors contributing to these shortages and to design appropriate retention and training strategies for midwives (Gialama et al., 2019).

In conclusion, while the WISN method provides valuable insights into staffing needs and workload management, it still predominantly relies on a quantitative approach, with limited consideration of the mental workload and teamwork aspects of midwifery practice (Dussault, 2003). Recent efforts aim to integrate psychosocial data to adjust ratios more accurately (McGillis Hall et al., 2003). Continued research and refinement of staffing methods are necessary to ensure optimal staffing levels and enhance the quality and safety of care in maternity units.

3. Methods

A cross-sectional descriptive study was carried out in 2021 among midwives in five units of a specialized hospital. The primary objective of the study was to evaluate midwifery workload and establish suitable staffing levels using the Workload Indicators of Staffing Need (WISN) methodology, which was developed by the World Health Organization. The researchers estimated the available working time for the midwives by taking into account authorized absences such as annual leave and unauthorized absences like sickness. The activities performed by the midwives were categorized into direct patient care, indirect care, additional activities, and supporting tasks. The researchers established activity standards for each category based on time and motion observations, and these standards were used to calculate yearly workload standards that became the benchmark for normative workload. The annual workload statistics, activity standards, and working time data were then entered into the WISN software, which automatically generated staffing ratios that compared the actual and normative workload. This enabled the researchers to identify shortages or adequacy gaps for the existing midwifery workforce.

4. Data Collection

The assessment of midwife workload and estimation of their staffing requirements using the WISN method required the collection of both qualitative and quantitative data from various sources.

Firstly, structured individual and group interviews were conducted with midwives and maternal health experts to identify the components of their work and estimate the required durations. Time and motion observations were also performed on a sample of professionals to measure execution times for key tasks. These measurements could be compared to prior collective estimates, allowing consolidating time standards per activity.

Secondly, an extensive documentary research was carried out to collect essential contextual data. HR records as well as services' schedules and activity reports were studied to quantify midwife staff levels and availability, as well as annual service volumes.

Ultimately, the combination of interview, observation and document analysis methods allowed the holistic compilation of the various work-related variables of midwives, providing essential empirical evidence for the subsequent implementation of the WISN methodology to adjust human resources to observed workload.

In this study, collected data underwent both manual statistical processing and analysis using the WISN software to assess workload and staffing needs specifically for midwives in healthcare. Following the estimation of available working time, the definition of workload components, the establishment of activity and workload standards, and the calculation of allocation factors, the total number of required midwifery personnel was determined utilizing the WISN tool. The analysis of results allowed an evaluation of the alignment between actual midwifery staffing levels and

theoretical requirements, with a specific focus on the WISN ratio to gauge workload pressure. This methodological approach provides a midwifery workforce projection that aids effective human resource planning while ensuring quality and safety in maternal and perinatal care.

5. Results and Discussion

The midwifery staff made up 29.24% (n=69/236) of the paramedical workforce and 15.36% of the total human resources (N=69/573) at the Batna Maternity Hospital. The annual available working hours for midwives, assessed at 1367.53 ± 172.01 hours, were determined using the WISN method, which accounts for all authorized and unauthorized absences. This comprehensive approach considers various factors such as leaves, training, and other absences to provide a precise estimate of the time actually dedicated to patient care by midwives throughout the year. Based on these data, the WISN method offers an in-depth understanding of the effective workload, thereby establishing a robust foundation for calculating the WISN ratio. This method, incorporating both quantitative and qualitative aspects, facilitates tailored staffing recommendations for the specific needs of each unit, contributing to optimizing operational efficiency and maintaining high standards of quality care. (See Table1).

Analysis of the maximum available working hours revealed significant variations among different hospital units. Midwives in the Family Planning Center unit, working 8 hours per day and five days a week, displayed the highest available time 1632, 00, while those in the postpartum unit recorded the lowest, with only 1084.72 hours per year. This discrepancy is partly explained by a higher absenteeism rate in the postpartum unit, averaging 81.95 days of absence per year for each midwife. These findings underscore the significant impact of authorized and unauthorized absences on the effective availability of personnel, highlighting the need for proactive human resource management to ensure an optimal distribution of workloads and guarantee quality care delivery. Integrating this information into the WISN ratio analysis provides crucial insights to inform staffing recommendations and enhance operational efficiency while preserving the quality of care. (See table1)

Our study examined the distribution of time by midwives at the Batna Maternal Health Institution in 2021; revealing variations in their workload across different units (see Figure 1). In the prenatal and delivery care unit, midwives devoted an average of 81.24% of their time to direct patient care activities, including exams, monitoring, delivery assistance, and postnatal care. Conversely, midwives in the family planning center allocated 71.68% of their time to support activities, such as admin tasks, meetings, and teaching (see Table 1).

Although support activities are essential for the center's smooth operation, a lower allocation of time for direct patient care may limit the availability of midwives to provide counseling and education services to women regarding family planning. The time allocation of midwives' work can significantly affect the quality of care provided. A higher proportion of time dedicated to direct patient care activities can foster trust with patients, facilitate comprehensive assessments of their health status, and ensure appropriate and timely management.

However, it is also crucial to give balanced attention to support activities, such as documentation, service coordination, and ongoing training, which play a key role in the overall effectiveness of maternal health services. Figure 1 demonstrates a predominance of support activities, highlighting the relevance of activity nature in personnel planning. In 4 out of 5 units, nursing support activities exceeded healthcare service activities. These support activities primarily include administrative and managerial tasks. This finding emphasizes the need to allocate adequate time and resources to these support activities to ensure the smooth operation of healthcare services. It is crucial to recognize that administrative and managerial tasks are essential for effective coordination, accurate documentation, and optimal resource management. However, it is also important to maintain a balance by ensuring sufficient time is allocated to healthcare service activities directly related to patient care.

Informed and balanced personnel planning should consider these results to optimize the quality of care while ensuring that support activities do not compromise the availability of healthcare professionals for direct patient care. Overall, there is a shortage of midwives compared to estimated needs. There are 69 midwives available for an estimated need of 74.84 according to standards, which represents a deficit of nearly 8%. The prenatal care and delivery service has the highest demand in terms of staffing (33.56 required) and has the largest deficit (five midwives missing). Other services such as postpartum care, obstetric emergencies, and high-risk pregnancies have smaller deficits (between one and three midwives depending on the service). Only the family planning center has slightly more staff than the standards require. Overall, we can conclude that the workload of midwives is significant in this facility, with

understaffed services. This could pose risks in terms of quality/safety of care and working conditions for the staff (See Figure 2).

A comparative evaluation of the normative and current midwifery staffing levels by department revealed disparities in four out of the five units, with a collective Workload Indicator of Staffing Need (WISN) ratio of 0.9, signifying that only 90% of the necessary resources were present. This 10% shortfall corresponded to three missing midwife positions based on the calculated workload pressures. The WISN ratios demonstrated a spectrum of values ranging from 0.83 to 1.12 across the departments, which indicated that existing staff members met between 83% and 112% of the estimated requirements. The lowest WISN ratios were observed in the delivery room (0.83) and the high-risk antenatal unit (0.88), where midwives were subjected to the most significant workloads. (Refer to Table 3).

Further examination of the WISN ratio variable unearthed significant insights. The average ratio for the hospital was 0.96 (standard deviation of 0.12), which signified a minor degree of dispersion around the mean. The minimum and maximum values were 0.83 and 1.12, which were documented in the delivery room and the obstetric emergency department, respectively. The lower quartile or 25th percentile was 0.89, the median was 0.91, and the upper quartile or 75th percentile was 1.04. This range and distribution of WISN ratios highlighted the disparate workloads between the hospital units, while simultaneously bringing to light serious shortcomings in essential frontline departments. The sub-threshold ratios indicated that the existing midwives were grappling with excessive workloads, which put a strain on the quality of care and their job satisfaction.

The results of the overall WISN ratio falling below the threshold (0.9) and the deficits observed in the labor ward and high-risk pregnancy services corroborated the findings of similar workload analyses conducted on midwives in the region, which employed other objective methods such as posture and heart rate (Bensekhria et al .,2014 , Bensekhria et al .,2016).

A study conducted among midwives in a university hospital center in Algeria yielded similar results, with a WISN ratio of 0.85 (Lahoucine et al., 2022). In contrast, a survey conducted in municipal hospitals in Tanzania revealed severe shortages, with WISN ratios ranging from 0.2 to 0.43, representing only 20% to 43% of the required midwifery workforces (Nyamtema et al .,2008) . Our study's relatively higher ratios may be attributed to the status of care in Algeria compared to municipal facilities, as well as the organization and regulation strategies of the workload.

These findings emphasize the importance of assessing workload types rather than solely volumes, as similar caseloads can mask varying demands between units. The variable WISN ratios between services despite an overall deficit illustrate this differentiated workload pressure. The lower quartiles concentrated below one indicate that shortages are not uniformly distributed but targeted on frontline clinical services.

To address these implications, urgent recruitment of additional midwives, particularly in labor wards and high-risk pregnancy units, is necessary, along with organizational reforms aimed at distributing tasks more equitably. The prospective application of the WISN methodology can facilitate continued benchmarking of the adequacy of midwifery workforces. Global studies confirm the usefulness of WISN as a standardized yet customizable approach, enabling evidence-based human resources planning for more robust maternal health systems, even in resource-constrained settings.

The correlation analyses of workload among midwives in this facility do not reveal significant relationships between the WISN ratio, available working hours ($r = 0,125$, $p = 0,841$), and time dedicated to direct patient care activities ($r = -0,356$, $p = 0,557$). The Pearson correlation coefficients (r) and corresponding p -values indicate that these variables are not statistically linked. These findings suggest that, within the specific context of this study, the WISN ratio is not directly associated with available working hours or the time allocated to direct patient care activities. This underscores the complexity of factors influencing workload and time management in the healthcare domain.

5.1 Numerical Results

Numerical Results presented in Table 1, Table 2 and Table 3 as following.

Table 1. Time Allocation of Midwives' Work in Different Units of Batna Maternity Hospital in 2021

Professional category	Units	Time allocated to direct patient care activities %	Time allocated to support activities %	Time allocated to additional activities %	Total
Midwives	Antenatal care and Delivery unit	81,24	13,86	4,90	100
	Postpartum Unit	41,16	44,50	14,34	100
	Obstetric emergency	45,89	45,70	8,41	100
	Family planning center	22,44	71,68	5,88	100
	High-risk Pregnancy unit	20,44	61,52	18,04	100
Mean ± SD		42,23 ± 28,05	47,45 ± 24,92	10,31± 5,69	

SD = Standard deviation

Table 2.:Analysis of Workload Indicators of Staffing Need (WISN) Results for Midwives in Batna Maternity Hospital by Units in 2021

Professional category	Midwives								
	Units	Number of non-working days	Number of working days	Number of working hours TTD	Full allocation of the category ACC	Allocation factor of the category FAC	Standard allocation of the category SAC	Individual standard allocation SAI	Individual allocation factor FAI
	Antenatal care and Delivery unit	41,26	115,25	1514,38	0,14	1,16	13,86	74,28	0,05
	Postpartum unit	81,95	86,42	1084,72	0,45	1,80	44,50	338,04	0,31
	Obstetric emergency unit	63,07	101,25	1292,96	0,46	1,84	45,70	108,77	0,08
	Family planning center	56,00	204,00	1632,00	0,72	3,53	71,68	96,00	0,06
	High-risk pregnancy unit	59,62	104,17	1313,58	0,62	2,60	61,52	237,02	0,18
	Mean ± SD	60,38 ± 14,87	122,22 ± 45,15	1367,53 ± 172,01	0,48 ± 0,17	2,39 ± 0,88	47,27 ± 18,12	170,02 ± 99,09	0,14 ± 0,09

Table 3. A Comparative Analysis of Existing and Recommended Staffing Levels, and the WISN Ratio, for Midwives across Various Departments at Batna Maternity Hospital in 2021.n

Professional category	Units	Available staff	Required staff	Gap	WISN Ratio	Workload
Midwives	Antenatal care and Delivery unit	28	33,56	-5,56	0,83	Moderately high
	Postpartum unit	08	8,97	- 0,97	0,89	Moderately high
	Obstetric emergency unit	18	16,08	1,92	1,12	Normal
	Family planning center	02	1,92	0,08	1,04	Normal
	High-risk pregnancy unit	13	14,31	-1,31	0,91	Normal
	Total		69	74,84	-5,84	0,92

5.2 Graphical Results

Results presented in Figure 1, Figure 2 as following

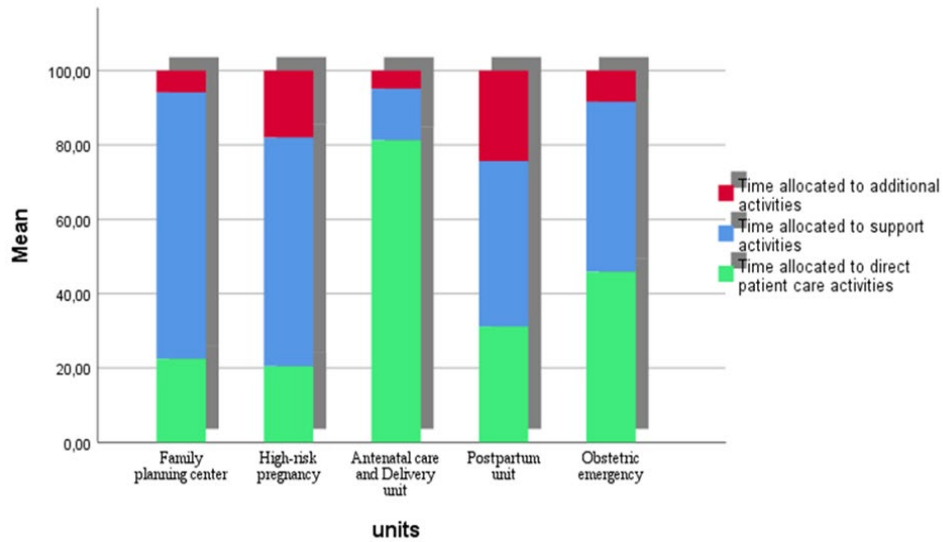


Figure 1. Time for Activities Related to Health Services, Time for Support Activities, and Time for Additional Activities

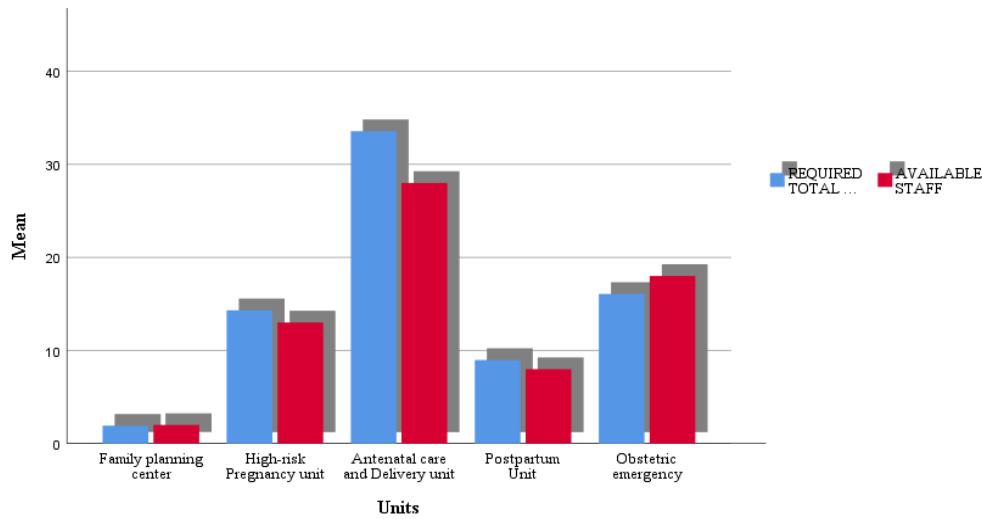


Figure 2. Average of required total staff, average of available staff per service in Batna maternity.

5.3 Proposed Improvements

It is recommended to expand the study area to include other professional groups within the institution. This expansion will allow for a more comprehensive understanding of potential factors influencing workload and staffing needs. In the healthcare environment, collaboration, mutual assistance, and task delegation are common, underscoring the importance of a more holistic study. By considering these aspects, we can better grasp interprofessional dynamics and formulate more precise recommendations for optimal staffing.

5.4 Validation

The validity of our study has been rigorously assessed using various methods. We conducted statistical tests, including hypothesis tests, to enhance the reliability of our results. The analyses included significance tests to evaluate the

robustness of the relationships highlighted by the data. These tests were performed with a significance threshold of 0.05

6. Conclusion

The varying workload pressures observed among different healthcare services, even within the same occupational category, highlight the importance of considering work processes, activity standards, and workload pressure when determining staffing requirements. This is particularly evident in the case of midwives working in maternity services at the Specialized Hospital Establishment in Batna, Algeria. The WHO's WISN methodology revealed staffing deficiencies in three of the five units, indicating a 8% overall shortfall in resources. The findings of this investigation emphasize the need for decision-makers to incorporate work process and activity standard considerations when devising strategies to address staffing needs. The study's results contribute to the existing body of research by shedding light on the specific challenges faced by midwives in Batna SHE and the importance of resource allocation in ensuring high-quality care without negatively influencing the well-being of healthcare providers. In conclusion, the research objectives have been met, and the study provides a unique contribution to the understanding of staffing requirements in maternity services.

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Biographies

Bensekhria Nardjese is a medical doctor with a doctoral degree in medicine. Since 2015, she has held the position of Assistant Professor in Occupational Medicine. She is currently pursuing her doctoral research in the field of objective assessment of physical workload among healthcare providers. Her research focuses on utilizing posture and heart rate measurements, as well as implementing the World Health Organization's Workload Indicators of Staffing Need (WISN) method. She is responsible for the exploratory unit within the Occupational Medicine Department at CHU Batna. Additionally, she is actively involved in teaching and research activities at the Faculty of Medicine in

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Benhassine Wissal is MD, PhD and Professor in Occupational Medicine; she graduated from universities of Constantine and Batna 2. She is ergonomic graduated from university of Tlemcen, Algeria. She is a teacher-researcher at the Faculty of Medicine of Batna where she contributes to the training of medical students. She trains specialist doctors in Occupational Medicine. She is the head doctor of the occupational medicine department at the university hospital center of Batna Algeria where she set up an occupational pathology unit and installed a occupational mental health consultation. She conducts research in the field of mental health at work, the organization of work in healthcare structures and emergency services, the diagnosis and monitoring of work-related musculoskeletal disorders, mainly back pain. She is an expert doctor for the social insurance funds of three Wilayas. Currently, she is working on a research project on the work organization of Emergency Services and its impact on employee well-being and patient safety.

Chenouf Nassira obtained her Doctor of Medicine degree in 2012. She then pursued residency training in Occupational Medicine from 2013 to 2018, graduating with a Specialization Diploma in Occupational Medicine. Since November 2018, Dr. CHENOUF Nassira has been working as an Occupational Health Physician in the Occupational Medicine Department of the University Hospital where she completed her residency. In addition to her clinical work, Dr.CHENOUF Nassira is actively involved in research on work-related illnesses and occupational risk prevention. She regularly presents at national and international scientific conferences. She authored an article in a special COVID-19 issue published by the Algerian Society of Occupational Medicine. Dr. CHENOUF Nassira also participated in a health survey of education professionals in Algeria.