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Research

Working conditions and environment of maternal and neonatal healthcare providers in the context of armed conflicts and humanitarian crises of Eastern DR Congo

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Abstract

Introduction Healthcare workers (HCW) play a crucial role in reducing maternal and infant mortality. However, in contexts of endemic armed conflicts, such as in the Democratic Republic of Congo (DRC), these professionals must operate under extreme working conditions, which can affect the quality of care. This study aims to assess the working environment and challenges faced by maternal and neonatal HCW in the DRC to better understand their ability to deliver quality care in a prolonged war context.

Methodology We conducted a cross-sectional study in the North and South Kivu provinces in Eastern DRC. The study primarily targeted healthcare facilities in eight health zones. An evaluation aligned with the structure/process dimensions (profile and perception of the work environment of HCW) according to Donabedian was conducted. A descriptive and comparative analysis of the health zones (HZs) using the Chi-square test and T test was performed. Informed consent was obtained for participation in the study.

Results A total of 200 HCW were enrolled in the study, 71% of whom were women, with an average age of 37.5 years. Nurses were the majority, followed by midwives, while general practitioners represented 10.67%. On average, HCW worked approximately 67 h per week. A third of HCW do not feel well-prepared and are dissatisfied with their work environment, reporting gaps in discussions about interpersonal skills, promotion opportunities, and professional development. Disparities in treatment were observed, with notable inequalities in training, time off, work hours, function, and promotions, often exacerbated by gender. Less than 30% received bonuses, and 90% did not receive non-monetary incentives. Verbal threats and assaults, humiliations, and physical assaults from colleagues and patients were common, with a higher incidence in women and from North Kivu. Finally, nearly a quarter of HCW felt exposed to insecurity in and around their facilities, a perception more pronounced in North Kivu than in South Kivu.

Conclusion This study shows that HCW in the DRC, particularly in conflict zones, work under extremely difficult conditions, characterized by intensive hours, lack of training, professional inequalities, and high insecurity. These challenges may

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compromise quality of care and the well-being of providers, underscoring the urgency of strengthening their protection and support to maintain the resilience of the healthcare system.

Keywords Armed conflicts · DR · Health workforce · Maternal and neonatal health · Providers working conditions

Abbreviations

BEmONC	Basic Emergency Obstetric and Neonatal Care
CAP	Complementary Activity Package
CEmONC	Comprehensive Emergency Obstetric and Neonatal Care
DDC	Swiss Agency for Development and Cooperation
DHS	Demographic and Health Surveys
DRC	Democratic Republic of the Congo
GRH	General Referral Hospital
HC	Health center
HCW	Health care worker
HZ	Health zone
LB	Live birth
MAP	Minimum activity package
MMR	Maternal mortality ratio
MNH	Maternal and neonatal health
NGO	Non-Governmental Organization
RHC	Referral health center
SD	Standard deviation
SSA	Sub-Saharan Africa
UNICEF	United Nations Children's Fund
WHO	World Health Organization

1 Background

As the health of the mother and child dyad is a priority for the survival of humanity, the United Nations General Assembly has adopted the Global Strategy for Women's, Children's and Adolescents' Health 2016–2030 as a strategic document to guide countries' policies to progress towards Sustainable Development Goals (SDGs) [1, 2]. These goals aim to reduce the global maternal mortality rate (MMR) to less than 70 deaths per 100,000 live births (LB). Neonatal and infant mortality should not exceed a maximum of 12 and 25 deaths per 1000 births, respectively [3].

Global data show that progress has been made in reducing maternal and infant mortality worldwide, decreasing from 385 deaths per 100,000 live births (LB) and 91 deaths per 1000 births in 1990 to 216 deaths per 100,000 LB and 43 deaths per 1000 births in 2015, respectively. These improvements were primarily observed in high-income and middle-income countries, with very little progress noted in Sub-Saharan African countries, particularly those in crisis such as the Democratic Republic of Congo (DRC) [1, 4–7]. Approximately 66% of global maternal deaths occur in Sub-Saharan Africa (SSA), with the DRC contributing to 5% of these maternal deaths [1, 6, 8]. The DRC faces some of the highest maternal, neonatal, and infant mortality rates globally, with maternal mortality showing significant fluctuations over the past two decades—rising from 540 to 693 deaths per 100,000 live births between 2010 and 2015, declining to 473 by 2017, and increasing again to 547 in 2020—while neonatal and infant mortality rates stand at 24 and 55 per 1000 live births, respectively [9–11].

Despite a gradual shift from home births to deliveries in healthcare facilities in many countries over recent decades, this transition has not led to a proportional improvement in maternal and neonatal health, as evidenced by stagnation of MMR. Despite substantial efforts to enhance access to family planning services, as well as essential and emergency obstetric and neonatal care, the anticipated benefits have not been fully realized [12, 13].

The "Lancet Global Health Commission on High Quality Health Systems" [14] has emphasized the importance of better understanding the dimension of quality within health systems, particularly in resource-limited settings. It provides compelling evidence that mere access to a health system does not necessarily ensure the provision of high-quality care. Furthermore, many recent studies on maternal and newborn care have revealed significant disparities in the quality of

care offered, both within low-income countries and between different countries [14–17]. A recent modeling exercise suggests that improving the quality of maternal and neonatal healthcare (without changing current levels of access or utilization) in low- and middle-income countries could prevent about a quarter of maternal deaths, neonatal deaths, and stillbirths [18–20]. The potential benefits of improving quality of care are likely even greater, given the impact that perceptions of quality have on decisions about seeking care, including when and where to do so [21–23].

Quality maternity care is a multidimensional concept. It is defined as the management of pregnancy and childbirth in which physical infrastructure, supplies and skilled human resources are available, and the provision of care is part of a normal physiological, social and cultural process [24]. The World Health Organization (WHO) has developed a framework for assessing the quality of care based on Donabedian's model, focusing on three aspects: outcomes, process, and structure. The structural aspect specifically examines the contexts and tools related to healthcare delivery rather than the care process itself. It assesses elements such as the adequacy of facilities and equipment, qualifications of medical staff, administrative organization, functioning of care programs, and other related aspects. The process aspect focuses on the interactions between healthcare providers and patients, including clinical practices, diagnostic and therapeutic interventions, and communication. Outcomes measure the impact of care on patient health, such as improvements in health status, complication reduction, patient satisfaction, and mortality and morbidity rates [25].

In the DRC, a country plagued by chronic internal and cross-border armed conflicts, there are significant gaps in studies assessing the quality of maternal and neonatal health (MNH) services, unlike in other regions of SSA where such research has already been conducted [26]. This gap is especially critical given that, despite an increase in hospital births, stagnation of MMR remains a persistent challenge [27].

Wars and other armed conflicts have a direct impact on healthcare systems, having devastating effects on health facilities, providers, and patients alike [28, 29]. To deliver quality care, healthcare workers (HCW) must themselves be in good mental health and in a healthy environment, which are severely compromised in conflict zones. Exposed to intense stress, violence, and secondary trauma, these professionals experience a deterioration in their psychological well-being, affecting their ability to provide adequate care [28, 30, 31]. While some providers' resilience enables them to manage stress constructively, contributing to the overall resilience of the healthcare system, these mechanisms should not lead to neglecting this crucial human resource, as they are not always sufficient to prevent burnout and compassion fatigue. This can also lead to a gradual decline in the quality of care provided to vulnerable populations [28, 32–34]. Furthermore, in conflict areas, health facilities are often damaged, looted, or destroyed, severely limiting access to essential medical services and leading to qualitative and quantitative deterioration in care [35].

The DRC has endured over three decades of armed conflict, particularly in the eastern part of the country, with severe impacts on the healthcare system [36]. While many consequences of these conflicts have been studied, including the destruction of infrastructure, their consequences on the mental health of healthcare providers and their working conditions remains largely unexplored in this war context. Yet, the extreme conditions under which healthcare providers operate, often under the threat of violence [37, 38] could generate immense psychological stress and professional burnout, leading to poor performance [39, 40]. We focused specifically on the structural aspect of Donabedian's model of quality care in this study, which examines the contexts, tools, and resources influencing the delivery of care, such as the adequacy of facilities, equipment, and staff qualifications The aim of was to assess the working environment and challenges faced by maternal and neonatal HCW in the DRC to better understand their ability to deliver quality care in a prolonged war context.

2 Methodology

2.1 Study design and framework

The survey was conducted in the North and South Kivu provinces in the eastern part of the DRC. It primarily targeted staff working in healthcare facilities including general reference hospitals (HGR), district hospitals (DH), reference health centers (RHC), and health centers (HC) in eight health zones (HZ)—five in South Kivu (Mwana, Minova, Miti-Murhesa, Kamituga, and Idjwi) and three in North Kivu (Kirotshe, Karisimbi, and Kayna) (Fig. 1). The selection of these HZ was based on their geographical accessibility and their status as action zones for the Swiss Agency for Development and Cooperation "DDC", a non-governmental partner that funded the study. In the DRC, a HZ is an administrative unit that serves as the basis for planning and executing health services. It is structured into a multi-tiered system comprising a network of healthcare facilities overseen by the Central Health Zone Office (CHZO). This

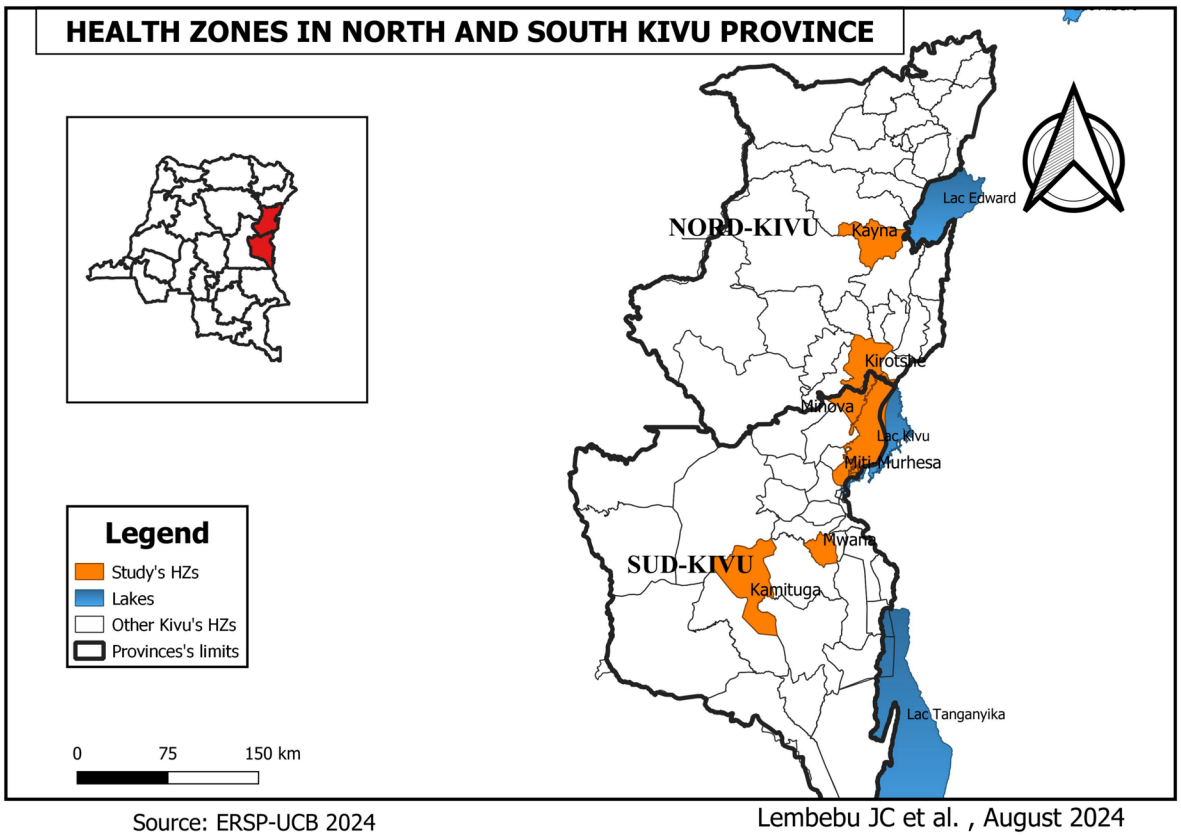

Fig. 1 Health zones in North and South Kivu provinces

network follows a referral chain where service capacities increase progressively. Health centers (HC) represent the primary level, providing basic health services grouped under the term minimum package of activities (MPA) and Basic Emergency Obstetric and Neonatal Care (BEmONC), including curative, preventive, promotional, and supportive care, all delivered by general nurses. Additionally, there are health posts and dispensaries offering services similar to those of HC. These facilities refer more complex cases to secondary referral hospitals (SRH), which offer a broader range of services known as the Complementary Package of Activities (CPA), including internal medicine, hospitalization, surgery, referral services, and technical support to HC through integrated supervision. Lastly, at the highest level are the general reference hospitals (GRHs), which also provide CPA and Comprehensive Emergency Obstetric and Neonatal Care (CEmONC).

Our study covered 8 HZs and included a total of 242 healthcare facilities (168 HCs, 50 HGRs, 16 RHs, and 8 GRHs).

2.2 Sampling and population

In each selected health zone, interviews were carried out by a random selection in 7 health facilities among those rated according to maternity service attendance (> 100 deliveries per month). The health facilities in the health zones were selected as follows:

- We selected the HGR in each HZ
- We took a simple random sample of two intermediate hospitals from the list of intermediate hospitals with more than 100 deliveries per month and at least five deliveries per day: the secondary hospital and referral health center (RHC)
- We took a simple random sample of four health centers (HC) from the list of those with more than 100 deliveries per month.

In all selected health facilities, all providers involved in maternal and child health care (maternity directors, qualified nursing staff, nurses, general practitioners and obstetricians) present in the workplace on the day of the survey and having provided at least 3 months of services in the facility were sampled. They were informed of the purpose of the study and invited to participate. A suitable time was agreed with the provider for interviewing the data collectors, so as not to interfere with patient care.

2.3 Interest variables and data collection

Data collection was based on a pre-tested electronic questionnaire using the Kobotoolbox server. From April to July 2023, eight teams composed of three people per team carried out the data collection. The interviewers spent three days in the GRHs and two days in all other facilities. Field data collection tools were drawn from validated questionnaires adapted to the local context. These were the Service Provision Assessment (SPA), and the Demographic and Health Surveys (DHS) (revision 2022) [41, 42].

The questionnaire gathered information on the participants' characteristics, their working conditions or environment, their experiences and their career prospects.

2.4 Data analysis

The coding and entry of the collected responses were carried out using Kobotoolbox software, and data analysis was performed with Stata 17. All variables were described according to the province (North and South Kivu). Categorical variables are summarized as proportions, while quantitative variables are presented as means with standard deviations. Differences between proportions of categorical variables were assessed using Pearson's chi-square test or Fisher's exact test, as appropriate. Differences in means between the two provinces were evaluated using the Student's t-test based on the conditions of application.

3 Results

3.1 Socio-demographic variables of participants

A total of 200 healthcare workers (HCW) were enrolled in our study, including 133 in South Kivu and 67 in North Kivu. The results indicate that overall, 71% of HCWs were female. Mean age was 37.5 years. Within the entire group, nurses represented the largest category, followed by midwives, with general practitioners accounting for 11%. The proportion of doctors assigned to maternal and neonatal health services was three times higher in South Kivu compared to North Kivu. Finally, the average tenure in the position within the facility was 1 year (Table 1).

3.2 Providers' perception of work environment and organization in their health facility

Table 2 summarizes the providers' perception of the work environment and organization within their health facility. On average, providers worked about 67 h per week, with providers in South Kivu reporting more hours than those in North Kivu, this difference being statistically significant. Regarding their perception of the work environment and organization within their health facility, nearly one-third of HCWs (32.8%) stated that they felt neither well-prepared nor trained for their current role. The majority indicated deficiencies in interpersonal skills with their supervisors, in opportunities for promotion, and in offer for career advancement, these issues being notably more reported in South Kivu compared to North Kivu.

Regarding treatment and professional opportunities, a significant proportion of HCWs reported experiencing unequal handling and opportunities in terms of training (31.5%), time off (24.7%), working hours (21.4%), preferred geographic assignments (31.5%), and career advancement (34.3%) compared to their opposite-sex colleagues. Regardless of gender, these proportions were higher in terms of training (55%), time off (43%), working hours (45.51%), preferred geographic assignments (46%), and career advancement (53%). Finally, compared with men, although this is not statistically significant, a large proportion of women feel that they do not have enough chance to have more promotion in terms of career advancement, choice in terms of geographical assignment location as well as free time. In addition, women feel that they receive less respect from their men colleagues as well as from the community (Table 3).

Table 1 Sociodemographic characteristics of participants

Variables	Total (n = 200)	Province		p
		North Kivu n = 67	South Kivu n = 133	
	% or mean ± SD			
Sex				0.23
Women	71.0	77.8	68.4	
Men	29.0	22.2	31.6	
Age (year)	37.5 ± 11.3	37.4 ± 10.1	37.5 ± 11.8	0.94*
Professional category				< 0.001
Nurse	44.9	73.3	35.3	
General doctor	10.7	4.5	12.8	
Community midwife	3.4	0.0	4.5	
Midwife	36.5	22.2	41.4	
Else (Aid for the mid, rapid training officer)	4.5	0.0	6.0	
Time in position (years)	1.5 ± 0.8	1.5 ± 0.7	1.5 ± 0.9	0.99
Type of care facility				0.027
Tertiary/referral hospital	6.7	6.7	6.8	
Secondary/general hospital	39.3	31.1	42.1	
Health center	48.9	48.9	48.8	
Heath post	5.1	13.3	2.3	

SD: Standard deviation; *T test

Nevertheless, nearly 95% of HCWs felt being well-respected by their colleagues and community. All providers reported receiving their wages on time. However, less than 30% mentioned receiving a state wage bonus or supplement. Additionally, about 9 out of 10 providers reported they never received any non-monetary incentives (Free time/holidays; Uniforms, backpacks, caps, discounted medication, free healthcare for you or your family, vouchers, food rations and subsidized housing). Finally, nearly half of HCWs considered that lack of respect was frequent in their professional environment.

3.3 Assaults from colleagues and patients

Table 4 illustrates the various types of assaults reported by HCWs. Regarding mistreatment by colleagues, threats and physical abuse were reported by 2.8% and 2.3% of HCWs, respectively. Other types of assaults by colleagues were reported at high rates, including shouting/screaming (28%), verbal threats (13%), humiliation (20%), and verbal abuse (22%).

These acts were reported with statistically similar frequency from both provinces. In terms of negative experiences from patients, the same trend was observed as with colleagues, with a higher incidence of verbal violence and aggression, humiliation, and shouting/screaming. However, there was a disparity by gender and between provinces, with more assaults being reported by women than men (Table 5) and from North Kivu than South Kivu. Additionally, there was a higher incidence of physical violence or aggression from patients towards healthcare staff, although at a low rate (Physically threaten 2.8% from colleague vs 6.7 from patients; physically mistreat 2.3% from colleague vs 3.4 from patients).

3.4 Effect of insecurity on maternal and neonatal health care in the facilities

According to the data presented in Table 6, nearly a quarter of providers felt exposed to insecurity within their facilities (24.7%) and during their commutes to and from these facilities (27%). This perception of insecurity was notably higher in North Kivu than in South Kivu. Regarding the level of violence around their workplace, including the increase in violence in their region and the level of violence in their professional area compared to their perception of security at home, a higher percentage of providers in North Kivu (over 60%) perceived these aspects as having significantly increased over the previous year compared to those in South Kivu (14%).

Table 2 Providers' perception of work environment and organization in their health facility

Variables	Total (n = 200) % or mean ± SD	North Kivu (n = 67) % or mean ± SD	South Kivu (n = 133) % or mean ± SD	P
Working hours per week	66.9 ± 20.5	59.9 ± 10.6	69.3 ± 22.8	0.001*
Supervision				
Lack of technical support or supervision in maternal and neonatal care work	14.6	11.1	15.8	0.88
No crosscheck of reports or files	4.6	2.5	5.4	0.35
Lack of work supervision	11.8	17.5	9.8	0.41
Lack of opportunity to ask questions or seek help	10.5	10.0	10.7	0.96
Lack of feedback (positive or negative) on performance	9.9	5	11.6	0.28
Lack of verbal or written feedback on work satisfaction	5	11.6	9.9	0.46
Lack of administrative or technical audits related to services	17.1	10	19.6	0.26
Lack of debriefing on problems encountered	12.5	7.5	14.3	0.44
Lack of assessment/discussion of clinical skills	17.1	27.5	13.4	0.039
Lack of assessment/discussion of interpersonal skills and soft skills	21.7	22.5	21.4	0.28
Professional development				
No opportunity for promotion	52.8	37.8	57.9	0.035
No career advancement offers	72.5	75.6	71.4	0.78
Perception of being well prepared and trained for current job	67.4	46.7	74.4	< 0.001
Unequal treatment and opportunities compared to colleagues of the opposite sex				
Training	31.5	26.7	33.1	0.25
Career advancement	34.3	28.9	36.1	0.017
Assignment to preferred geographical positions	31.5	24.4	33.8	0.001
Free time	24.7	17.8	27.1	0.20
Working hours	21.4	17.8	22.6	0.66
Similar opportunities to other colleagues in terms of				
Training	55.1	46.7	57.9	0.002
Career advancement	53.4	24.0	57.4	0.007
Assignment to preferred geographical positions	46.1	33.3	50.4	< 0.001
Free time	43.8	31.1	48.1	0.06
Working hours	45.5	40.0	47.4	0.18
Respect from colleagues				0.82
Totally agree	27.5	22.2	29.4	
Agree	68.0	73.4	66.2	
Disagree	0.6	0	0.7	
Totally disagree	2.2	2.2	2.3	
I prefer not to answer	0.6	0.0	0.7	
Don't know	1.1	2.2	0.7	

Table 2 (continued)

Variables	Total (n = 200) % or mean ± SD	North Kivu (n = 67) % or mean ± SD	South Kivu (n = 133) % or mean ± SD	P
Respect from the community				0.49
Totally agree	36.5	26.7	39.8	
Agree	57.9	64.4	55.6	
Disagree	1.1	2.2	0.8	
Totally disagree	1.7	2.2	1.5	
Don't know	2.8	4.5	2.3	
Reward				
Getting paid	100	100	100	
Salary received on due date	91.6	97.8	89.5	0.08
Government bonus	29.8	20.0	33.1	0.09
Earning additional income	23.0	17.8	24.8	0.47
Lack of non-monetary incentives (Free time/holidays; Uniforms, backpacks, caps, discounted medication, free healthcare for you or your family, vouchers, food rations and subsidized housing)	88.2	82.2	90.2	0.16

SD: Standard deviation; *T test

Table 3 Providers' perception of work environment and organization in their health facility disaggregated by gender

Variables	Total (n = 200)	Female (n = 142)	Male (n = 58)	P
	%	%	%	
Unequal treatment and opportunities compared to colleagues of the opposite sex				
Training	31.5	31.7	30.7	1.000
Career advancement	34.3	35.7	30.7	0.844
Assignment to preferred geographical positions	31.5	29.3	36.5	0.538
Free time	24.7	23.0	28.8	0.768
Working hours	21.4	22.2	19.2	0.358
Similar opportunities to other colleagues in terms of				
Training	55.1	56.3	51.9	0.603
Career advancement	53.4	35.5	57.6	0.266
Assignment to preferred geographical positions	46.1	42.0	55.7	0.220
Free time	43.8	40.4	51.9	0.333
Working hours	45.5	44.4	48.0	0.748
Respect from colleagues				0.033
Totally agree	27.5	21.4	42.3	
Agree	68.0	73.0	55.7	
Disagree	0.6	0.8	0	
Totally disagree	2.2	3.1	0	
I prefer not to answer	0.6	0.7	0	
Don't know	1.1	0.7	1.9	
Respect from the community				0.317
Totally agree	36.5	32.5	46.1	
Agree	57.9	61.1	50.0	
Disagree	1.1	1.6	0	
Totally disagree	1.7	2.3	0	
Don't know	2.8	2.3	3.8	
Reward				
Getting paid	100	100	100	
Salary received on due date	91.6	92.8	88.4	
Government bonus	29.8	29.3	30.7	
Earning additional income	23.0	25.4	17.3	
Lack of non-monetary incentives (Free time/holidays; Uniforms, backpacks, caps, discounted medication, free healthcare for you or your family, vouchers, food rations and subsidized housing)	88.2	85.7	94.2	

4 Discussion

The results of this study conducted in the Eastern DRC, a region that has experienced over three decades of armed conflict, provide an in-depth look into the perception of the work environment and conditions faced by MNH providers in a context of chronic geopolitical instability.

Data show that 71% of the HCWs were female, with a mean average age of 37.5 years. A large proportion of interviewed subjects were nurses, followed by midwives, while general practitioners made up only 10.67%. The proportion of doctors was three times higher in South Kivu compared to North Kivu. On average, providers reported working approximately 67 h per week.

Regarding work organization, one-third of providers generally felt inadequately prepared for their jobs. A large proportion reported gaps in communication about interpersonal skills, career advancement, and professional development. This represents a major unmet need, as interactions and discussions with supervisors are crucial for learning and improvement opportunities [43]. These findings align with those of an international cross-sectional

Table 4 Assaults from colleagues and patients disaggregated by provinces

Variables	Total (n = 200)	North Kivu (n = 67)	South Kivu (n = 133)	P value
	%	%	%	
Did a colleague …you?				
Physically threaten	2.8	2.2	3.0	0.78
Physically mistreat	2.3	2.2	2.3	0.99
Shout at	28.1	37.8	24.8	0.09
Humiliate	19.7	24.4	18.1	0.35
Verbally threaten	12.9	20.0	10.5	0.10
Verbally or psychologically abuse	22.3	17.8	24.1	0.38
Pressure you to perform a sexual act	2.3	4.4	1.5	0.25
Did a patient …you?				
Strike	0.6	0	0.8	0.56
Physically threaten	6.7	11.1	5.3	0.18
Physically mistreat	3.4	2.2	3.8	0.62
Shout at	21.4	37.8	15.8	0.002
Humiliate	16.3	31.1	11.3	0.002
Verbally threaten	16.3	28.9	12.0	0.008
Verbally or psychologically abuse	14.0	22.2	11.3	0.07
Pressure you to perform a sexual act	0.6	2.2	0	0.09

Table 5 Assaults from colleagues and patients disaggregated by gender

Variables	Total (n = 200)	Female (n = 142)	Male (n = 58)	P value
	%	%	%	
Did a colleague …you?				
Physically threaten	2.8	3.1	1.9	0.543
Physically mistreat	2.3	2.3	1.9	0.851
Shout at	28.1	31.7	19.2	0.091
Humiliate	19.7	23.8	9.6	0.030
Verbally threaten	12.9	12.7	13.4	0.890
Verbally or psychologically abuse	22.3	24.6	17.3	0.289
Pressure you to perform a sexual act	2.3	3.1	0	0.194
Did a patient …you?				
Strike	0.6	0.8	0	0.519
Physically threaten	6.7	7.9	3.8	0.322
Physically mistreat	3.4	4.0	2.0	0.492
Shout at	21.4	23.8	15.3	0.212
Humiliate	16.3	16.6	15.3	0.833
Verbally threaten	16.3	15.8	17.3	0.814
Verbally or psychologically abuse	14.0	12.7	17.3	0.421
Pressure you to perform a sexual act	0.6	0.7	0	0.519

SSA study from Benin, Malawi, Tanzania, and Uganda, where participants reported a lack of supervision, access to education, training resources, and support from their superiors. Such shortcomings can influence providers' ability to enhance their knowledge, and such perceived and/or factual managerial gaps may prevent HCWs from translating knowledge into skills and behaviors, thereby reducing their capacity to implement best practices and deliver high-quality care [44].

Nearly one-third of HCWs reported verbal abuse, humiliation, and chronic pressure. Although rare (2%), physical assaults were reported, with North Kivu appearing more affected by these acts, both from colleagues and patients. This

Table 6 Effect of insecurity on HCW perceived safety at work

Variables	Total (n = 200)	North Kivu (n = 67)	South Kivu (n = 133)	P
	%	%	%	
I am protected from violent incidents on site				0.004
Totally agree	17.9	2.2	23.3	
Agree	55.1	53.3	55.6	
Disagree	14.0	24.4	10.5	
Totally disagree	10.7	15.7	9.0	
I prefer not to answer	0.6	0.0	0.8	
Don't know	1.7	4.4	0.8	
I am protected from violence on the way to and from my workplace				< 0.001
Totally agree	15.7	0	21.0	
Agree	55.1	51.1	56.4	
Disagree	15.7	33.3	9.8	
Totally disagree	12.4	15.6	11.3	
Don't know	1.1	0.0	1.5	
The area around my workplace is marked by violence				< 0.001
Totally agree	9.6	15.7	7.5	
Agree	29.2	68.9	15.8	
Disagree	35.9	8.9	45.1	
Totally disagree	21.9	4.4	27.8	
Don't know	3.4	2.2	3.8	
The level of violence in the area has increased compared to the previous year				< 0.001
Totally agree	4.5	11.1	2.3	
Agree	23.0	55.5	12.0	
Disagree	36.0	13.3	43.6	
Totally disagree	27.5	11.1	33.1	
Don't know	9.0	8.9	9.0	
Safety around my workplace is similar to that around my home				< 0.001
Totally agree	17.4	4.4	21.8	
Agree	55.6	48.9	57.9	
Disagree	19.1	37.8	12.8	
Totally disagree	7.3	8.9	6.8	
Don't know	0.6	0.0	0.7	

difference may be linked to the more persistent conflicts plaguing North Kivu. In terms of safety, HCWs from North Kivu reported a higher perception of insecurity, particularly from increased overall violence in the region [45]. These findings corroborate those of a recent study from the same area, which reported that nearly half of providers experienced assaults while performing their duties, with a larger proportion of patients as aggressors [37]. Similar results were reported in several studies from other conflict-affected regions, including Uganda [34], Ethiopia [46], Syria [35], Yemen [28], Palestine [47] and Iraq [40]. These studies reported mixed assaults perpetrated by colleagues, armed groups, and patients. Persistent armed conflicts have significant consequences on the psychological health of the population, including post-traumatic stress and anxiety, which can be exacerbated by patient's concerns about their health. This situation could also underlie the increase in violence in these regions [48, 49],

Data on potential disparities in treatment reveal that a substantial proportion of providers reported inequalities in training, professional promotions, geographic postings, time off, and work hours. It is also important to consider issues related to gender equity in professional environments. For example, data from Maini et al. show that men were more likely to receive allowances and performance bonuses compared to women, highlighting the need for targeted policies to ensure equitable redistribution of resources, as well as other benefits and advantages, among men and women [50].

The WHO emphasizes occupational safety and health, including adequate remuneration, as an essential dimension of strengthening the health workforce and ensuring decent conditions of employment, as the remuneration of health

professionals is a crucial issue in addressing human resource challenges in the health sector [51]. Our findings align with previous research, highlighting significant disparities and occasional irregularities in the remuneration of HCWs in the DRC. While the majority of HCWs in our study declared receiving their salary on time, some indicated that this was inconsistent, and many received neither bonuses or non-monetary incentives. These can negatively impact motivation and performance and, consequently, quality of care. This situation is particularly concerning in contexts where basic wage is often already insufficient to cover daily needs, which is frequently the case in the DRC [50, 52, 53].

Our analysis reveals critical issues that resonate with observations from other low-resource settings, particularly regarding informal incentives. Insufficient and irregular salaries for HCWs could exacerbate the trend observed in such settings, where in order to compensate for inadequate income, HCWs may resort to informal additional payments. This situation, combined with a lack of bonuses and incentives, also undermines HCWs' motivation and performance, which can lead to disparities in access to healthcare and reduced quality of care, especially for poor patients. Informal payments, often associated with perceptions of corruption and inadequate accountability mechanisms, exacerbate inequalities and highlight an urgent unmet need for reforms in human resource management and remuneration policies [54, 55].

Regarding the work environment, our results show that HCWs felt particularly exposed to insecurity, both within their facilities and during travel between home and workplace, with a heightened perception of violence in North Kivu, a region of nearly constant conflict compared to South Kivu. Furthermore, more than half of providers in North Kivu (60%) reported that violence around their workplace increased over recent time, compared to 14% in South Kivu. This observation aligns with similar findings from other conflict zones, such as Uganda, where healthcare personnel have been victims of abductions and attacks, and Ethiopia, where periods of war and siege have severely impacted care delivery and professional motivation. Similarly, in Yemen and Syria, providers faced pervasive violence and constant stress, highlighting the vulnerability of HCWs in areas of intense conflict, affecting their safety, morale, and effectiveness [28, 34, 46, 56]. Such conditions contravene the Geneva Conventions, which mandate the protection of civilians, humanitarian workers, injured persons, and healthcare personnel during armed conflicts [57].

Certain methodological limitations should be taken into account when interpreting the present results. One of the major limitations of our study lies in the risk of selection bias. Indeed, having excluded less frequented establishments with potentially different realities, may have masked certain information and thus the representativeness of all healthcare providers in the health zone may not have been known. Another important limitation is that data were only collected in certain HZs within the two provinces (South Kivu and North Kivu), chosen for their geographical accessibility as well as being action zones of the DDC partner who funded the study.

5 Conclusion

This study quantifies and objectively highlights the extremely challenging working conditions and obstacles faced by healthcare providers in the DRC, particularly in conflict zones such as North and South Kivu. Despite undeniable commitment, the predominantly female healthcare providers contend with heavy work schedules, inadequate training and support, and professional treatment disparities. Insecurity, both within healthcare facilities and during commutes, is a major concern, exacerbated by physical and verbal violence from both colleagues and patients. Such degraded working conditions not only compromise the quality of care provided, but also the psychological well-being of the providers, which are crucial for ensuring the resilience of the healthcare system. It is therefore imperative to enhance the protection and support of healthcare providers in adverse geopolitical settings to enable them to continue delivering quality care despite the challenges posed by a workplace environment plagued by violence and insecurity.

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Author contributions PM conceived and designed the experiments. CL and GN did the data collection. MD contributed to specific areas of data analysis and quality control. PM, CL and GN analyzed the data. PM and CL wrote the first draft of the manuscript. GN, EN, CCZ, SM, BB, CMB, CCM, RBN, MD and MPH, and GB contributed to the writing of the manuscript and agree with the manuscript's results and conclusions. All authors have read the submitted manuscript.

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Data availability Data is provided within the manuscript or supplementary information files.

Declarations

Ethics approval and consent to participate Informed consent was obtained from all subjects. Respondents provided signed informed consent for participation to the study, either by written signature or by fingerprints, depending on literacy. All procedures performed in this study were approved by the Institutional Ethics Committee of the Université Catholique de Bukavu under the reference UCB/CIES/NC/021/2022 and were in accordance with the 1964 Helsinki declaration and its later amendments. Data collection authorization was obtained from the healthcare facilities to be visited, following approval from the Provincial Division of Health and the Chief Medical Officer of the Health Zone.

Consent for publication Not applicable.

Competing interests The authors declare no competing interests.

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