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Original article

Effect of WHO-Guided Training Interventions on Maternal and Neonatal Health Service Quality in Primary Health Care Facilities in Benghazi: A Quasi-Experimental Pre–Post Study

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Abstract
The study aims to evaluate the effectiveness of training interventions based on World Health Organization (WHO) guideline recommendations on the quality of maternal and neonatal health care services at primary health care facilities (PHCFs) in Benghazi, Libya. A quasi-experimental pre–post study was conducted among 71 primary health care workers (PHCWs) in selected primary health care facilities in Benghazi between 2023 and 2024. The intervention included structured training sessions for PHCWs according to WHO recommendations. Data were collected at four time points (pre-intervention, immediate, 3 months, and 6 months post-intervention) using performance checklists, satisfaction scales, and structured questionnaires. Statistical analysis included descriptive statistics and Friedman tests for repeated measures. The present study reported a significant improvement in PHCWs' performance across antenatal, natal, and postnatal care domains ($p < 0.001$). Also, satisfaction levels increased significantly across all domains, particularly in communication, patient-centered care, and safety indicators ($p < 0.001$). WHO-based training interventions significantly improved the quality of maternal and neonatal health services at the primary care level. Sustained improvements suggest that such interventions can enhance provider performance and patient satisfaction; however, periodic reinforcement may be necessary to maintain gains over time.
Keywords: Maternal Health, Neonatal Care, Primary Health Care, Training Intervention.

Introduction

The improvement of maternal and neonatal health remains a primary global public health objective, particularly in low- and middle-income countries where preventable morbidity and mortality rates stay high [1]. Although the availability of maternal health services has increased, many negative outcomes are now linked to the substandard quality of care rather than a lack of access [2]. Consequently, the World Health Organization (WHO) emphasizes the adoption of evidence-based practices, patient-centered models, and improved communication as fundamental tools for lowering avoidable deaths and enhancing patient outcomes [3]. Quality in this sector is frequently analyzed using the Donabedian framework, which splits care into structure, process, and outcomes [4]. Within this model, the "process of care" defined by the clinical competence and performance of healthcare providers is a major factor in health outcomes [5].

While primary health care workers (PHCWs), including physicians and midwives, are vital to service delivery, their effectiveness is often hindered by training gaps, inconsistent use of clinical guidelines, and wide variations in practice [5]. In Libya, maternal and neonatal health indicators showed progress for decades, but recent political instability and resource shortages have strained the health system [6]. Despite high coverage for antenatal services, evidence reveals ongoing deficiencies in care quality, such as poor clinical techniques and a lack of patient-focused communication Demeke, H. S., et al. (2024). "Reported that domains of "effective communication had relatively low quality within the antenatal care provided [7-8]. Furthermore, there is a significant lack of intervention-based research exploring strategies to improve the quality of primary maternal and neonatal care within Libya [9].

Educational interventions based on WHO recommendations are a promising method for enhancing the knowledge and skills of healthcare staff [10]. Globally, these programs have been shown to improve service delivery, increase compliance with medical standards, and boost patient satisfaction [11]. However, there is still limited evidence concerning the long-term effectiveness and sustainability of these training programs, specifically within the Libyan healthcare environment [9-11]. Therefore, this study aimed to evaluate the impact of a WHO-guided training intervention on the performance and satisfaction of primary health care workers in delivering antenatal, natal, and postnatal care services in primary health care facilities in Benghazi. The study further assessed changes over multiple time points to determine both immediate and sustained effects of the intervention.

Maternal and child health remains a major global public health priority. Despite progress in medical care and international health initiatives, maternal mortality continues to pose a significant challenge, particularly in low- and middle-income countries [12]. The quality of care during pregnancy, childbirth, and the postnatal period fundamentally influences both maternal and neonatal outcomes, making it essential to understand the knowledge, attitudes, and practices of pregnant women regarding antenatal and postnatal care, as well as the effectiveness of interventions designed to improve care quality [3].

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The World Health Organization emphasizes that every woman has the right to receive quality care during pregnancy, and antenatal care (ANC) has been proven to reduce maternal and perinatal morbidity and mortality [3].

However, the effectiveness of ANC services depends not only on their availability but also on women's understanding of their importance, their engagement with healthcare providers, and the quality of care delivered within health facilities. This literature review synthesizes current evidence on knowledge, attitudes, and practices related to maternal and newborn care across diverse geographical and cultural contexts, examines factors that influence healthcare-seeking behaviors, evaluates the effectiveness of educational and quality improvement interventions, and explores the institutionalization of quality-of-care standards in maternal and newborn health services. Bhattacharyya et al [13] conducted a qualitative study in Uttar Pradesh, India, examining pregnant women's expectations of quality care in public health facilities and contrasting these with providers' perceptions. Through focus group discussions with rural women in their final trimester of pregnancy and in-depth interviews with care providers, the research identified several major themes prioritized by women: Availability of doctors at facility, Availability of medicine, Food provision, Ambulance services, Maintenance of cleanliness and hygiene, Privacy protection, Good and safe delivery without complications, Client-provider interaction quality, and financial cost of care [13].

The provided Maternal and neonatal health care services' quality indicators, namely, input, process, impact, and satisfaction, will be promoted by application of a quasi–experimental interventional study in the form of a training for the primary health care workers (PHCWs) in accordance with the adopted World Health Organization guideline recommendations (AWHOGR) in Benghazi, Libya. The study aimed to conduct health interventions, in accordance with the Adopted World Health Organization Guideline Recommendations (AWHOGR) [14-17] and the available outcome indicators, to promote the maternity and neonatal health quality process, and satisfaction of the provided health care services at primary health care facilities (PHCFs) in Benghazi, Libya. The study describes the characteristics of the primary health care workers (PHCWs) at PHCFs in Benghazi, Libya, to identify the process indicators and satisfaction of the PHCWS team, namely, physicians, nurses, and midwives, in accordance with the AWHOGR on maternity and neonatal health care services at PHCFS in Benghazi, Libya, and monitor the process indicators of the PHCWs' activities after the conduction of the health training and in accordance with AWHOGR, at PHCFs in Benghazi, Libya.

Methods

Study Design, Participants, and Setting

This quasi-experimental study was conducted to enhance the quality of performance among primary health care workers (PHCWs) in Benghazi, Libya, through structured WHO-guided training interventions. All PHCWs at the selected primary health care facilities (PHCFs) who were available during the fieldwork period and consented to participate were included. Training sessions were evaluated using pre- and post-test assessments to measure changes in performance.

Data collection

Formal approval to conduct the study was obtained from the Ministry of Health in Benghazi. Research instruments were developed in accordance with the *Arab World Health Organization Guidelines and Recommendations (AWHOGR)* published between 2014 and 2017 [14–17]. Data collection relied on three main tools:

1. **Semi-Structured Interview Questionnaire** This instrument captured demographic and professional characteristics of primary health care workers (PHCWs), including age, gender, nationality, qualifications, certifications, work position, years of experience, and duration of service.
2. **Pre- and Post-Test Performance Checklist** A structured checklist was used to evaluate PHCWs' practices (process indicators) and satisfaction with maternal and neonatal services during pregnancy, intrapartum, and postpartum periods. Assessments were conducted before and after the training intervention, following the adopted AWHOGR framework [14–17].
3. **Pilot Study**

Study tools validity and reliability

The study tools were translated into Arabic by the researchers and tested for their content validity index by two experts in the community health field at faculty of Alexandria University. Content validity was calculated as the sum of very related and related items divided by the total number of items on the sheet, across two experts. Validity index was 0.86 for tool one, 0.91 for tool two, and 0.93 for tool three. Reliability of the tools were investigated by test-retest reliability methods by using alpha - Cronbach's test. Reliability for tool one was 0.86, tool two 0.89, and tool three 0.88.

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Results

Characteristics of primary healthcare workers (PHCWs) in Benghazi, Libya:

A total of 71 health-care providers participated in the study, including 56 physicians and 15 nurses/midwives. Regarding age distribution, physicians were generally younger than nurses and midwives. Nearly half of physicians (46.4%) were aged 25–34 years compared with 13.3% of nurses/midwives. In contrast, the majority of nurses and midwives (80.0%) were aged ≥45 years, compared with only 25.0% of physicians. This difference was statistically significant (x^2=5.96, p=0.015). The overall mean age of participants was 39.5±8.4 years, and the median age was 38 with an interquartile range of (33-47), with physicians having a mean age of 37.9±7.8 years and a median age of 34.5(32-45.8) while nurses/midwives had a mean age of 45.0±8.3 years and a median age of 48(26-54) years.

Most participants were married (76.1%), including 78.6% of physicians and 66.7% of nurses/midwives. Smaller proportions were single (16.9%), divorced (5.6%), or widowed (1.4%). No statistically significant difference was observed between the two groups regarding marital status (x^2=1.8, p=0.41).

Educational level showed a marked difference between the groups. All physicians (100%) held a college degree, whereas all nurses and midwives (100%) had a diploma qualification. This difference was highly statistically significant (x^2=39.54, p<0.001).

With respect to duration of professional experience, more than half of physicians (57.2%) had less than 10 years of experience, while the majority of nurses and midwives (73.3%) had 20 years or more. This difference was statistically significant (x^2=31.6, p<0.001). The mean duration of experience was 11.1±10.3 years among physicians and 21.3±8.9 years among nurses/midwives, with an overall mean of 11.6±10.7 years.

Concerning the basis of clinical practice, most participants reported relying on experience and colleagues' advice (65.0%), followed by national guidelines (16.7%) and personal experience alone (12.9%). There was no significant difference between physicians and nurses/midwives in this regard (x^2=1.002, p=0.801). In terms of training related to maternal and child health care, 53.5% of participants reported receiving training. A higher proportion of physicians (57.1%) had received such training compared to nurses/midwives (40.0%); however, this difference was not statistically significant (x^2=4.4, P=0.111).

Table 1. Distribution of Primary Health care workers (Physicians, Nurses & midwives) at Benghazi, Libya according to socio-demographic & professional characteristics (N=71):

Characteristics	Physicians (N= 56)	Nurses & midwives (N= 15)	Total (N= 71)	Test of significant Chi square
	n (%)	n (%)	n (%)	
Age interval/year				
25–34	26 (46.4)	2 (13.3)	28 (39.5)	
35–44	16 (28.6)	1 (6.7)	17 (23.9)	X^2_1=5.9
≥ 45	14 (25.0)	12(80.0)	26 (36.6)	P =0.015*
Mean ± SD (Min–Max)	37.9±7.8(29-58)	45.0±8.3 (26-54)	39.5 ± 8.8 (26–58)	
Median & (interquartile range)	34.5(32-45.8)	48(26-54)	38(33-47)	
Marital status				
Married	44 (78.6)	10 (66.7)	54 (76.1)	
Single	9 (16.1)	3 (20.0)	12 (16.9)	X22=1.8
Divorced	2 (3.6)	2 (13.3)	4 (5.6)	& P = 0.41
Widow	1 (1.8)	0 (0.0)	1 (1.4)	
Education				
College	56 (100)	0 (0.0)	56 (78.9)	X^2_1=39.5
Diploma	0 (0.0)	15 (100)	15 (21.1)	P<0.001**
Duration of experience:				
< 10	32 (57.2)	2 (13.3)	34 (53.3)	
10–19	12 (21.4)	2 (13.3)	14 (20.0)	X_3^2 = 31.6
≥ 20	12 (21.4)	11 (73.3)	23 (26.7)	P< 0.001**
Mean ± SD (Min–Max)	11.1±10.3 (1-31)	21.3 ±8.9 (5-32)	11.6±0.7 (0.6–32)	
Basis of their practices:				
Experience& colleagues' advice	39 (69.6)	12 (80.0)	51 (65.0)	X_3^2 = 1.0
National guidelines	10 (18.9)	0 (0.0)	10 (16.7)	P = 0.801
Experience	7 (10.7)	3 (20.0)	10 (12.9)	
Training regarding maternal and child health care				
Yes	32 (57.1)	6 (40.0)	38 (53.5)	X^2_1 = 4.4
No	24 (42.9)	9 (60.0)	33 (46.5)	P = 0.111

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Primary Health Care Workers' Performance and satisfaction with ANC, NC& PNC Service Components at Benghazi PHCFs across four- time assessments (n = 71)

The evaluation of healthcare workers' performance across antenatal care (ANC), neonatal care (NC), and postnatal care (PNC) domains demonstrated varying patterns of improvement following the intervention. Table 2 showed the performance indicators (categorical: "Not done", "Need improvement", "Adequately done") for 71 participants at four time points: pretest(T0), immediately post-intervention (T1), 3 months(T3), and 6 months(T6). The continuous mean scores (presumably a composite performance metric) are also provided. The trend of antenatal care (ANC) performance across the four assessment points is illustrated in (Figure 1).

Performance of primary health care workers (PHCWs) across antenatal care (ANC), natal care (NC), and postnatal care (PNC) domains demonstrated statistically significant improvements over time (Friedman test, $p < 0.001$). In the ANC domain, the proportion of adequately performed tasks increased from 26.1% at baseline to 43.7% immediately post-intervention, with sustained improvement at 3 months, and slight decline at 6 months (39.4%). The mean score improved from 113.3 ± 12.5 to 116.9 ± 10.8. For neonatal care services, performance improved progressively, with adequately done tasks increasing from 56.3% at baseline to 69.0% at 6 months, accompanied by an increase in mean score from 74.6 ± 15.2 to 78.8 ± 12.6. Similarly, PNC performance showed continuous improvement, with adequately performed tasks increasing from 47.9% pre-intervention to 59.2% at 6 months, and mean scores rising from 33.9 ± 8.6 to 35.6 ± 7.4. Overall, these findings indicate a sustained positive impact of the intervention on PHCWs' performance across all maternal health service domains.

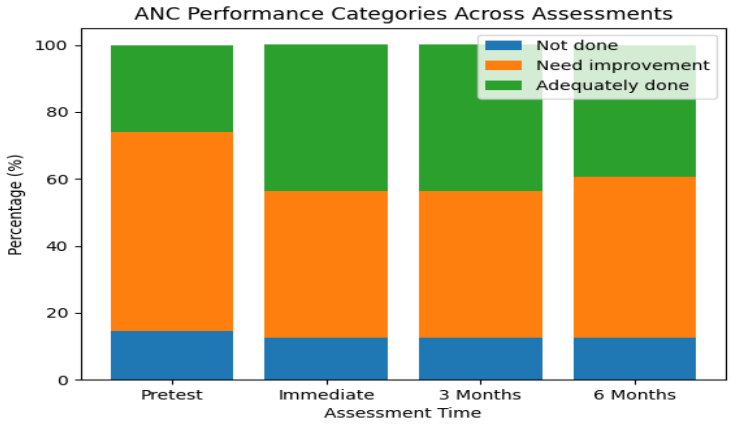

Figure 1. Primary Health Care Workers' Performance with ANC Service Components at Benghazi PHCFs Across four- time assessments (n = 71)

Intrapartum and immediate neonatal care PHCWs performance demonstrated a delayed but substantial improvement. While minimal changes were observed immediately after the intervention, a significant increase in the adequately performed category was observed at 6 months (69.0%), accompanied by a reduction in the "not done" category (8.5%). This improvement was statistically significant ($p = 0.027$). Table 2: showed that the 6-month follow-up assessment of neonatal care (NC) performance demonstrated a marked improvement compared to earlier assessments. The proportion of healthcare workers classified as "adequately done" increased substantially to 69.0%, compared to 56.3% at baseline and earlier follow-ups. Concurrently, the proportion categorized as "not done" decreased significantly to 8.5%, while those requiring improvement declined to 22.5%. This trend was also statistically significant (Friedman $X(3)^2 = 41.67$ & $p < 0.001$).

Across all assessment points, NC performance showed a progressive improvement pattern. While, initial gains were modest immediately after the intervention and remained stable at 3 months, a more pronounced improvement was observed at the 6-month follow-up. These findings indicated a delayed but substantial enhancement in performance levels over time. The comparison of neonatal care (NC) performance across the four assessment points using the Friedman test revealed a statistically significant difference (Friedman $X(3)^2 = 23.4$ & $p = 0.021$). The mean performance score increased progressively from 74.6 ± 15.2 at baseline to 78.8 ± 12.6 at the 6-month follow-up. While, only modest changes were observed immediately after the intervention and at 3 months, a marked improvement was evident at 6 months, reflected by an increase in the proportion of healthcare workers achieving "adequately done" performance (69.0%) and a reduction in the "not done" category (8.5%). This trend was also statistically significant (Friedman $X(3)^2 = 41.1$ & $p < 0.001$).

The present study indicated that PNC performance showed a gradual and progressive improvement over time. The proportion of adequately performed activities increased from 47.9% at baseline to 59.2% at 6 months, with a corresponding reduction in the "not done" category from 19.7% to 8.5%. This trend was also statistically significant (Friedman $X3^2 = 33.0$ & $p = 0.001$) table (2).

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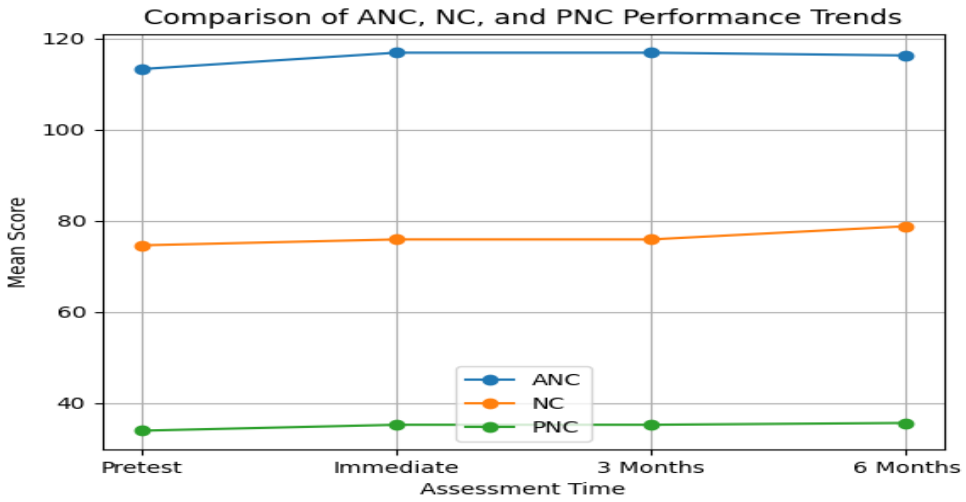

Figure 2: Trends of Primary Health Care Workers' Performance With ANC, NC, and PNC Service Components at Benghazi PHCFs Across Four-Time Assessments

Table 2: Primary Health Care Workers' Performance With ANC, NC, and PNC Service Components at Benghazi PHCFs Across four- time assessments (n = 71):

Domain	Assessment	Not Done n (%)	Need Improvement n (%)	Adequatel y Done n (%)	Mean ± SD	Test of Significance Friedman X_3^2= df(3)
ANC	Pretest	10 (14.5)	41 (59.4)	18 (26.1)	113.3 ± 12.5	
	Immediate	9 (12.7)	31 (43.7)	31 (43.7)	116.9 ± 10.8	41.7
	3 Months	9 (12.7)	31 (43.7)	31 (43.7)	116.9 ± 10.8	p< 0.001*
	6 Months	9 (12.7)	34 (47.9)	28 (39.4)	116.3 ± 10.9	
NC	Pretest	14 (19.7)	17 (23.9)	40 (56.3)	74.6 ± 15.2	
	Immediate	11 (15.5)	20 (28.2)	40 (56.3)	75.9 ± 13.8	41.1
	3 Months	11 (15.5)	20 (28.2)	40 (56.3)	75.9 ± 13.8	p< 0.001*
	6 Months	6 (8.5)	16 (22.5)	49 (69.0)	78.8 ± 12.6	
PNC	Pretest	14 (19.7)	23 (32.4)	34 (47.9)	33.9 ± 8.6	
	Immediate	9 (12.7)	23 (32.4)	39 (54.9)	35.2 ± 7.9	
	3 Months	9 (12.7)	23 (32.4)	39 (54.9)	35.2 ± 7.9	33.0
	6 Months	6 (8.5)	23 (32.4)	42 (59.2)	35.6 ± 7.4	P< 0.001*

Primary Health Care Workers' Satisfaction With ANC, NC, & PNC Service Components at Benghazi PHCFs Across four- time assessments (n = 71):

Table 3 and Figure 3 present a longitudinal assessment of antenatal care (ANC) satisfaction of PHCW across four categories—overall satisfaction, administrative/service organization, clinical care/procedures, laboratory and screening tests, and health education/counseling measured at pre-test, immediately post-intervention, and at three- and six-month follow-up. Across all five domains, the proportion of satisfied participants increased substantially from pre-test to immediate post-test and remained consistently elevated at the three- and six-month assessments. For overall ANC satisfaction, the percentage satisfied rose from 35.2% at baseline to 74.6% immediately post-intervention, with sustained levels of 80.3% at three months and 77.5% at six months. Similar patterns were observed for the sub-domains: clinical care/procedures showed the highest post-intervention satisfaction (83.1% immediately after, 85.9% at three months, and 84.5% at six months), while administrative/service organization and laboratory/screening tests also demonstrated marked improvements that were maintained over time. Friedman tests indicated statistically significant changes across the four time points for every domain, with p-values ranging from <0.001 to 0.002. The largest chi-square values were observed for overall satisfaction ($x^2 = 32.8$, $p < 0.001$) and health education/counseling ($x^2 = 30.1$, $p < 0.001$), suggesting that these dimensions were particularly responsive to the intervention.

These findings indicate that the intervention was associated with immediate and sustained improvements in satisfaction with antenatal care. The consistency of results across all sub-domains, coupled with the stability of satisfaction at three and six months, supports the durability of the observed effects. Notably, the proportion of unsatisfied participants across all categories remained low after the intervention, with no evidence of regression toward baseline levels by the six-month follow-up

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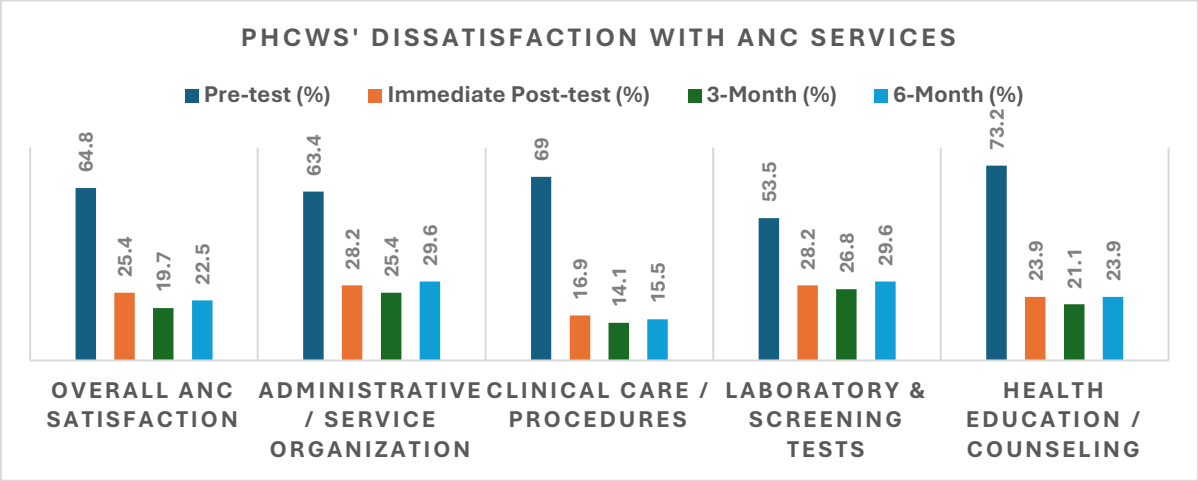

Figure 3. PHCWs' Dissatisfaction with ANC Service Components at Benghazi PHCFs Across Four Assessment Points

Table 3. Primary Health Care Workers' Satisfaction (n = 71) With ANC Service Components at Benghazi PHCFs Across four- time assessments:

Category	Satisfaction Status	T0 n (%)	T1 n (%)	T3 n (%)	T6 n (%)	Friedman x^2 (df=3)	p-value
Overall ANC Satisfaction	Unsatisfied	46 (64.8)	18 (25.4)	14 (19.7)	16 (22.5)	32.8	p< 0.001*
	Satisfied	25 (35.2)	53 (74.6)	57 (80.3)	55 (77.5)		
Administrative / Service Organization	Unsatisfied	45 (63.4)	20 (28.2)	18 (25.4)	21 (29.6)	14.6	p= 0.002*
	Satisfied	26 (36.6)	51 (71.8)	53 (74.6)	50 (70.4)		
Clinical Care / Procedures	Unsatisfied	49 (69.0)	12 (16.9)	10 (14.1)	11 (15.5)	18.9	p< 0.001*
	Satisfied	22 (31.0)	59 (83.1)	61 (85.9)	60 (84.5)		
Laboratory & Screening Tests	Unsatisfied	38 (53.5)	20 (28.2)	19 (26.8)	21 (29.6)	22.3	p< 0.001*
	Satisfied	33 (46.5)	51 (71.8)	52 (73.2)	50 (70.4)		
Health Education / Counseling	Unsatisfied	52 (73.2)	17 (23.9)	15 (21.1)	17 (23.9)	30.1	p< 0.001*
	Satisfied	19 (26.8)	54 (76.1)	56 (78.9)	54 (76.1)		

Table 4 presents a cross-sectional assessment of primary health care workers' (PHCWs) satisfaction with specific aspects of natal care among a cohort of 71 participants. Each item was dichotomized into "satisfied" and "unsatisfied" categories, and chi-square tests were applied to evaluate differences in proportions, although the grouping variable is not explicitly stated. The following commentary interprets the findings with reference to satisfaction levels and the statistical significance of observed differences.

Overall Satisfaction and Domain-Specific Findings

Overall satisfaction was low, with only 46.5% of respondents reporting satisfaction ($p = 0.553$, non-significant). This baseline level aligns with pre-test data from the longitudinal analysis, where overall satisfaction ranged between 35.2% and 46.5% across domains.

Within the Labor Support & Patient-Centered Care domain, only one item reached statistical significance. The statement "Midwives anticipate mothers' needs" showed a significantly lower satisfaction rate (36.6%, $p = 0.024$), highlighting a gap in proactive support during labor. Other items—such as receiving better care than expected (40.8% satisfied) and enough support from doctors and midwives (43.7% satisfied)—did not achieve significance but still reflect persistently low satisfaction.

Interpersonal Care & Respect items were uniformly non-significant (all $p > 0.05$), with satisfaction ranging from 39.4% (good attitude of doctors and midwives) to 49.3% (kindness and trust by midwives). The lack of significant differences suggests that respect and kindness were perceived similarly across respondents, though satisfaction remained below 50% for most items.

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Communication & Information Sharing revealed two highly significant deficits: only 35.2% reported that procedures were explained before being performed (p = 0.009), and just 32.4% indicated that permission was sought before physical contact (p = 0.001). These findings underscore critical shortcomings in informed consent and respectful communication during intrapartum care.

Pain Management was another area of concern, with only 38.0% of respondents satisfied (p = 0.043), pointing to inadequate relief of labor pain. Finally, Safety & Abuse-Free Care showed the most striking results. Although the prevalence of abuse was relatively low—7.0% reported ever being beaten by a nurse, and 12.7% reported verbal abuse—the chi-square values were exceptionally high (p < 0.001 for both). This suggests that even infrequent experiences of abuse were strongly associated with overall dissatisfaction or with other unmeasured factors.

Table 4: Baseline PHCWs' Satisfaction with Natal (Delivery) Services at PHCFs in Benghazi, Libya (n = 71):

Domain	Natal Care Item	Unsatisfied n (%)	Satisfied n (%)	Chi-square	p-value
	Overall satisfaction score	38 (53.5)	33 (46.5)	0.35	0.553
Labor Support & Patient-Centered Care	Mothers received better care than expected	42 (59.2)	29 (40.8)	2.82	0.093
	Enough support from doctors & midwives	40 (56.3)	31 (43.7)	1.14	0.286
	Midwives encouraged mothers during labour	37 (52.1)	34 (47.9)	0.13	0.713
	Midwives anticipate mothers' needs	45 (63.4)	26 (36.6)	5.08	0.024*
Interpersonal Care & Respect	Kindness & trust by obstetricians	40 (56.3)	31 (43.7)	1.14	0.286
	Kindness & trust by midwives	36 (50.7)	35 (49.3)	0.01	0.927
	Kindness & trust by pediatricians	39 (54.9)	32 (45.1)	0.69	0.405
	Kindness & trust by pediatric nurses	41 (57.7)	30 (42.3)	1.70	0.192
	Good attitude of doctors & midwives	43 (60.6)	28 (39.4)	3.52	0.061
	They are very respectful	40 (56.3)	31 (43.7)	1.14	0.286
	They speak to mothers kindly	39 (54.9)	32 (45.1)	0.69	0.405
	Show respect to mothers & families	42 (59.2)	29 (40.8)	2.82	0.093
Communication & Information Sharing	Procedures explained before performing	46 (64.8)	25 (35.2)	6.89	0.009*
	Seek permission before touching	48 (67.6)	23 (32.4)	10.8	0.001*
Pain Management	Adequate pain management	44 (62.0)	27 (38.0)	4.11	0.043*
Safety & Abuse-Free Care	Ever beaten by a nurse	5 (7)	66 (93)	51.0	<0.001*
	Ever verbally abused by a nurse	9 (12.7)	62 (87.3)	35.6	<0.001*

Table 5: Primary Health Care Workers' Satisfaction with Natal Service Components at Benghazi PHCFs Across four- time assessments (n = 71):

Domain	Satisfaction Status	T0 n (%)	T1 n (%)	T3 n (%)	T6 n (%)	Friedman x^2 (df=3)	p-value
Labor Support & Patient-Centered Care	Unsatisfied	45 (63.4)	21 (29.6)	18 (25.4)	19 (26.8)	31.0	<0.001*
	Satisfied	26 (36.6)	50 (70.4)	53 (74.6)	52 (73.2)		
Interpersonal Care & Respect	Unsatisfied	41 (57.7)	20 (28.2)	17 (23.9)	18 (25.4)	30.8	<0.001*
	Satisfied	30 (42.3)	51 (71.8)	54 (76.1)	53 (74.6)		

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Communication & Information Sharing	Unsatisfied	47 (66.2)	23 (32.4)	20 (28.2)	21 (29.6)	33.6	<0.001*
	Satisfied	24 (33.8)	48 (67.6)	51 (71.8)	50 (70.4)		
Pain Management	Unsatisfied	44 (62.0)	19 (26.8)	17 (23.9)	18 (25.4)	27.5	<0.001*
	Satisfied	27 (38.0)	52 (73.2)	54 (76.1)	53 (74.6)		
Safety & Abuse-Free Care	Unsatisfied	14 (19.7)	7 (9.9)	6 (8.5)	7 (9.9)	18.1	<0.001*
	Satisfied	57 (80.3)	64 (90.1)	65 (91.5)	64 (90.1)		

Baseline Satisfaction with Postnatal Care (PNC) Services

Table 6 presents the baseline satisfaction of primary health care workers (PHCWs) with postnatal care services at PHCFs in Benghazi (n = 71). The findings reveal markedly low satisfaction across nearly all assessed PNC components, underscoring substantial deficiencies in the quality and comprehensiveness of services provided. Statistically significant differences were observed for all items.

Dissatisfaction was most pronounced in critical clinical and preventive care elements. Screening for complications showed the highest dissatisfaction rate (90.1%, $p < 0.001$), followed by breastfeeding encouragement (88.7%, $p < 0.001$), home visits (87.3%, $p < 0.001$), and iron and folate supplementation (84.5%, $p < 0.001$). These results highlight serious gaps in essential postnatal interventions fundamental to safeguarding maternal and neonatal health. Similarly, low satisfaction with contraceptive counseling (83.1%, $p < 0.001$) reflects inadequate integration of family planning services within PNC.

Systemic issues were also evident in service organization and continuity of care. Dissatisfaction with the duration of postnatal care (66.2%, $p = 0.006$) and early discharge practices—where 80.3% of women reported not staying ≥24 hours ($p < 0.001$)—suggest weaknesses in follow-up and monitoring. Early discharge without adequate observation is a well-documented risk factor for missed complications and poor maternal outcomes. Further deficiencies were noted in physiological assessment (77.5%, $p < 0.001$) and postpartum depression screening (62.0%, $p = 0.043$). Although dissatisfaction with depression screening was relatively lower, its statistical significance indicates that mental health components remain particularly under-addressed within the current service delivery framework.

Table 6. Baseline satisfaction of PHCWs with PNC Services at PHCFs, Benghazi, Libya (n = 71) :

PNC Item	Unsatisfied n (%)	Satisfied n (%)	x^2	p-value
Duration of PNC	47 (66.2%)	24 (33.8%)	7.46	0.006*
Stayed ≥24 hours	57 (80.3%)	14 (19.7%)	26.06	<0.001*
Physiological assessment	55 (77.5%)	16 (22.5%)	21.42	<0.001*
Screening for complications	64 (90.1%)	7 (9.9%)	45.76	<0.001*
Iron & folate supplementation	60 (84.5%)	11 (15.5%)	33.84	<0.001*
Postpartum depression screening	44 (62.0%)	27 (38.0%)	4.08	0.043*
Contraceptive counseling	59 (83.1%)	12 (16.9%)	31.12	<0.001*
Breastfeeding encouragement	63 (88.7%)	8 (11.3%)	42.62	<0.001*
Home visits	62 (87.3%)	9 (12.7%)	39.58	<0.001*

Overall Satisfaction of PHCWs (n = 71) at PHCFs, Benghazi, Libya with Postnatal Care at Four Assessment Points**: (**Table7**)**

The analysis of women's satisfaction with postnatal care services across the four assessment points demonstrated a significant improvement over time. At baseline, the majority of participants were classified as unsatisfied (69.0%), while only 31.0% reported satisfaction. Following the intervention, satisfaction levels increased progressively, reaching 43.7% immediately post-intervention, 67.6% at 3 months, and 76.1% at the 6-month follow-up.

Conversely, the proportion of unsatisfied women declined markedly from 69.0% at pretest to 23.9% at 6 months. The Friedman test revealed a statistically significant difference across the four time points ($x^2 = 22.3$, $df = 3$, $p < 0.001$), indicating a consistent and sustained improvement in satisfaction levels over time.

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Table 7. Overall Satisfaction of PHCWs (n = 71) at PHCFs, Benghazi, Libya with Postnatal Care at Four Assessment Points:

Satisfaction Status	T0 n (%)	T1 n (%)	T3 n (%)	T6 n (%)	Friedman x^2 (df = 3)	p-value
Unsatisfied	49 (69.0%)	40 (56.3%)	23 (32.4%)	17 (23.9%)	22.3	<0.001*
Satisfied	22 (31.0%)	31 (43.7%)	48 (67.6%)	54 (76.1%)		

Pre-test (T0), Immediate Post-test (T1) ,3-Month Post-test (T3) , 6-Month Post-test (T6)

Discussion

The current study of 71 PHCWs in Benghazi reveals that clinical performance in Antenatal Care (ANC), Neonatal Care (NC), and Postnatal Care (PNC) is highly responsive to intervention, as evidenced by the significant Friedman test results ($p < 0.001$). The present study revealed the Benghazi workforce characteristics—notably the physician-heavy staffing model (79% physicians), in contrast with the global and EMR region push toward midwifery-led care [13]. While countries like Jordan and Saudi Arabia have transitioned toward university-degree nursing programs, the 100% diploma-level education among Benghazi's nurses and midwives highlights a vocational gap that persists in parts of North Africa [14,15]. In many EMR countries, structural challenges such as limited access to updated protocols and high workloads often hinder the adoption of evidence-based practice (EBP)[16]. The specific lack of MCH training for 60% of nurses in this study is a critical finding, as frontline staff education is the primary driver for reducing maternal and neonatal morbidity in low-to-middle-income countries [17,18]. The present study demonstrated that WHO-guided training interventions significantly improved the performance and satisfaction of primary health care workers (PHCWs) across antenatal (ANC), natal (NC), and postnatal care (PNC) service components. The findings highlight the critical role of structured capacity-building interventions in strengthening the quality of maternal and neonatal health services at the primary care level. The trend of antenatal care (ANC) in the current study across the four assessment points in Performance of primary health care workers (PHCWs) during antenatal care (ANC), natal care (NC), and postnatal care (PNC) domains demonstrated statistically significant improvements over time (Friedman test, $p < 0.001$).

In the ANC domain, the proportion of adequately performed tasks increased from 26.1% at baseline to 43.7% immediately post-intervention, with sustained improvement at 3 months, and a slight decline at 6 months (39.4%). For neonatal care services, performance improved progressively, with adequately done tasks increasing from 56.3% at baseline to 69.0% at 6 months, and similarly, PNC performance showed continuous improvement, with adequately performed tasks increasing from 47.9% pre-intervention to 59.2% at 6 months**.** Overall, the findings indicate that the intervention had differential effects across domains, with immediate impact observed in ANC, delayed improvement in NC, and gradual, sustained improvement in PNC. Both NC ($p=0.027$) and PNC ($p=0.037$) showed statistically significant improvements. The training appears most effective in these areas, particularly in shifting workers from "Not Done" to "Adequately Done." In NC, adequacy reached a high of 69.0% by the 6th month. The Study findings indicate that the intervention had differential effects across domains, with immediate impact observed in ANC, delayed improvement in NC, and gradual**.** Similar findings have been reported in other quasi-experimental studies, emphasizing the importance of continuous professional development and refresher training programs [19]. This pattern suggests that certain clinical skills require time for integration into routine practice. Previous research supports this observation, indicating that behavioral change and skill retention often occur gradually as providers gain confidence and practical experience [20,21].

Postnatal care (PNC) performance demonstrated a progressive and sustained improvement over time. This finding is particularly important, as postnatal care is frequently underutilized and inadequately delivered in many low-resource settings. Studies have shown that strengthening provider capacity in PNC can significantly improve maternal and neonatal outcomes, especially when interventions include both training and supportive supervision [22]. The study also revealed substantial improvements in satisfaction across all domains, including communication, patient-centered care, and safety. The marked improvement in communication and information-sharing practices aligns with existing evidence that provider training enhances respectful maternity care and patient satisfaction [23,24]. Effective communication is a key component of quality care and has been associated with improved health outcomes and increased service utilization.

The significant reduction in dissatisfaction related to pain management and abuse-free care further underscores the impact of the intervention on improving the experience of care. These findings are consistent with WHO recommendations emphasizing respectful, dignified, and patient-centered maternity care as essential components of quality health services [25]. Importantly, the reduction in "not done" service components across all domains reflects improved service availability and delivery, which has direct implications for maternal and neonatal health outcomes. Even incremental improvements in service provision can contribute to reducing preventable morbidity and mortality in resource-limited settings [26]. Despite these positive findings, a considerable proportion of PHCWs remained in the "needs improvement" category at the 6-month follow-up. This suggests that training alone may not be sufficient to achieve optimal

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performance levels. Additional strategies, such as on-the-job supervision, mentoring, and continuous quality improvement (CQI) approaches, may be required to sustain and enhance the gains achieved through training [27,28]. Overall, the findings of this study are consistent with international evidence supporting the effectiveness of WHO-based training interventions in improving maternal and neonatal health care quality. The results highlight the need for integrating continuous training and supportive supervision into health system strengthening strategies, particularly in settings such as Benghazi where health system challenges persist.

Conclusion

Despite these positive findings, a considerable proportion of PHCWs remained in the "needs improvement" category at the 6-month follow-up. This suggests that training alone may not be sufficient to achieve optimal performance levels. Additional strategies, such as on-the-job supervision, mentoring, and continuous quality improvement (CQI) approaches, may be required to sustain and enhance the gains achieved through training. Improvement of frameworks is necessary to achieve 100% adequacy in maternal and neonatal services. Future research should explore the long-term sustainability of such interventions and assess their direct impact on maternal and neonatal morbidity and mortality.

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Conflicts of Interest

The authors declare no conflicts of interest.

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