Satisfaction in Delivering Maternal and Neonatal Health Services During a Pandemic: Recommendations for Infection Preparedness and Response Protocols and Employee Support for Community Health Workers

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Abstract

Aim: Community health workers (CHWs) have emerged as salient health team members in disadvantaged primary settings to provide critical services to disadvantaged mothers and their newborns. There is need for empirical evidence to understand how CHWs may be supported in delivering maternal and neonatal health services during pandemics.

Subject and Methods: In this study we used bivariate regression to identify the lower odds for CHW perceived satisfaction for maternal and neonatal health services, with respect to client socio-demographic characteristics, coronavirus preparedness, coronavirus responsiveness, and employee satisfaction. In addition, we used structural equation modeling to investigate if coronavirus responsiveness and employee satisfaction as mediating variables influence the relationship between coronavirus preparedness and maternal and neonatal health services.

Results: From a sample of 350 CHWs across 35 districts of Punjab, we found 30 predictors with respect to coronavirus preparedness, coronavirus responsiveness and employee satisfaction which contribute to lower odds of maternal and neonatal health services. We also identified that employee satisfaction is a key mediator in the relationship between coronavirus preparedness and maternal and neonatal health services.

Conclusion: We conclude with 4 critical recommendations to support CMWs in delivering optimal services, comprising: education and training, operational support, public acceptance, and employee support and benefits.

Introduction

Community health workers (CHWs) are instrumental in improving maternal and neonatal health indicators in conservative countries like Pakistan where the mobility of women is restricted due to cultural and religious interpretations and women are dependent on health services at the doorstep (Gilmore & McAuliffe, 2013). The additional and essential role that CMWs are expected to perform during the coronavirus pandemic is creating awareness and ensuring prevention for infection control in underprivileged and semi-literate communities (Bhaumik, Moola, Tyagi, Nambari, & Kakoti, 2020). Recent scholarship highlights that there is greater vulnerability to mothers and newborns during pandemics in developing countries, and also greater risk of still-births (McClure et al., 2020).

Doorstep services in the community during pandemics are not just essential for reproductive health services, but also for protection of mother, newborn and entire families through guidance about both infection control and coronavirus symptom management (Webber & Chirangi, 2020). In Pakistan, the women CHWs play a critical role in facilitating access to primary healthcare for women, and in addition, is the only healthcare support for majority impoverished women in the country (Shaikh & Hatcher, 2005). The Pakistan Ministry of National Health Services, Regulation and Coordination launched the National Programme for Family Planning and Primary Health Care commonly referred to as the Lady Health
Workers program in 1994 which has successfully deployed over 110,000 CMWs across disadvantaged communities across Pakistan (Farooq & Arif, 2014).

After recruitment CHWs receive 15 months of training and are designated to visit 1,500 women in the community to provide antenatal, natal, and postnatal services (Hafeez, Mohamud, Shiekh, Shah, & Jooma, 2011). They are also responsible for referral to nearby health facilities and provision of health education, including infection control and prevention (Douthwaite & Ward, 2005). However, CMWs in Pakistan are known to face considerable challenges while delivering services, the main two being low pay and community resistance in accepting services from non-traditional agents (Closser & Jooma, 2013). Another issue is the low quality training they receive at induction, and the drop in their knowledge and skill set due to non-existence of a regular training system (Oxford Policy Management, 2002).

Despite the challenges they face, evidence shows that CHWs have been effective in some indicators for maternal and neonatal health, such as: increasing tetanus coverage, immunization, attended deliveries, and exclusive breastfeeding (Jalal, 2011). With regard to areas related to infection control, CHWs have also been evidenced to improve women’s awareness and practices with regard to sterilizing drinking water and improving hygiene (Rabbani, Perveen, et al., 2016). In the age of coronavirus, the impact of CHWs services assumes greater significance with regard to educating mothers in the community about corona prevention and management.

After the 18th constitutional amendment in 2011 the subject of health was devolved to provinces. In 2013, the provincial government of Punjab, integrated the Lady Health Workers program with three other programs: (i) The Maternal Neonate Child Health program, (ii) Nutrition program, and (iii) The Basic Emergency Obstetric Care program. This new integrated system is called the Integrated Reproductive Maternal Neonatal Child Health (IRMNCH & NP) programme (Nishtar, 2011). In Punjab 78% of rural and 30% of the urban population is covered by CHWs across the 36 districts of the province (Oxford Policy Management, 2002). Post the spread of coronavirus December 2019 in Pakistan, there have been guidelines issued by The Primary and Secondary Healthcare Department (Punjab Government, 2020). However, the major limitation is that no formal training has carried out, and only guidelines for prevention, sanitation and symptom management have been distributed through booklets to CHWs. There has been no investigation about the efficacy and limitations of these guidelines, additional needs for preparedness and response, or the quality of primary healthcare services for maternal and newborn health during the pandemic.

Study aims

The perceived satisfaction of CHWs in delivering maternal and neonatal health services is an important indicator of mother and newborn wellbeing (Wilford et al., 2018). In the absence of sufficient research during the coronavirus pandemic (Singhal, 2020), it is important for independent researchers to help in filling the gaps about how maternal and neonatal health services are influenced by coronavirus preparedness and responsiveness in community health workers. At first step we aimed to identify the
lower odds for CHW perceived satisfaction for maternal and neonatal health services, with respect to four areas: 1. socio-demographic characteristics; 2. coronavirus preparedness; 3. coronavirus responsiveness; and 4. employee satisfaction.

Local literature highlights that CHWs face considerable occupational challenges (Hafeez et al., 2011), and that their service response and employee satisfaction may influence maternal and neonatal health services. Thus, at second step we also aimed to investigate the interplay among study variables by performing structural equation modeling (SEM). Thus, the objective of our fifth and last research question was to examine: 5. how coronavirus responsiveness and employee satisfaction as mediating variables influence the relationship between coronavirus preparedness (independent variable) and maternal and neonatal health services (dependent variable). We believe our study is important for not just healthcare practitioners with weak bargaining power and inadequate governance voice in developing countries (Iacobucci, 2020), but also for the poor women dependent on primary healthcare services in low-income communities of the world (Hick & Biddinger, 2020).

Methods

This study adopted a cross-sectional quantitative design. Ethics approval for this study was taken from the Institutional Review Board, Forman Christian College University. A cover letter was provided to CHWs describing the study and informed consent was taken (Panter & Sterba, 2011). No names were taken from the respondents and there was no risk to their safety. Respondents were assured that they could withdraw from the study at any point during the telephonic interview. No incentives were offered for participation in this study.

Sample

The selection criterion for this study was all currently working, government employed, CMWs called Lady Health Workers (LHWs) providing outreach services at the doorstep of the community. A total of 44,700 LHWs are deployed in the rural and urban slums of Punjab (Kayani, Khalid, & Kanwal, 2016). The target sample for this study based on Taros sampling formulae and population of LHWs in Punjab was estimated at 327 (Yamane, 1967).

Measures

The survey included questions from three standardized tools and consisted of 58 items. There were 6 questions addressing socio-demographic characteristics of respondents (Appendix A).

Coronavirus Preparedness and Responsiveness

Coronavirus preparedness and responsiveness was measured using 27 questions from the Zika Outbreak Emergency Preparedness and Response Survey (Rajiah et al., 2019). This survey includes items from a checklist developed by The Center For Disease Control and Prevention and World Health Organisation, which assesses how prepared healthcare professionals are for an pandemic outbreak. Minor
modifications for relevancy to coronavirus were made. A five point Likert scale was used ranging from ‘strongly disagree’ to ‘strongly agree’. A sample item for measuring coronavirus preparedness was “I know all the information about coronavirus preparedness related to my community needs”, and a sample item for coronavirus responsiveness was “I can manage the common symptoms and reactions of coronavirus”.

Employee Satisfaction

Employee satisfaction was measured using 13 questions from the Community Health Worker Employer Survey (Chaidez, Palmer-Wackerly, & Trout, 2018). A five point Likert scale was used ranging from ‘strongly disagree’ to ‘strongly agree’. This measure took into consideration employee support from coworkers and supervisors, and satisfaction with regard to workload, pay, and contractual benefits. Items included statements like “My supervisor/team leader treats me with respect” and “My workload is reasonable”.

CHW satisfaction with maternal and neonatal health services delivered

CHW satisfaction with maternal and neonatal health services delivered was measured using the scale Self-reported Performance of MCH Workers- Nepal (Chhetry, Clapham, & Basnett, 2005). The measure included 12 items related to satisfaction with antenatal care, postnatal care, emergency care, birthing care, and newborn care. A five point Likert scale was used ranging from ‘strongly disagree’ to ‘strongly agree’. The measure included items like “I am satisfied with delivery of services for prior referrals for birth care” and “I am satisfied with delivery of services for birth complications managed and/or referred”.

Data Collection

We requested a list of mobile contact numbers of CHWs from the IRMNCH & NP, Punjab, and were able to gain access to a list of 1,000 numbers. The authors of the study recruited and trained 12 women research assistants for the data collection during a two week period through zoom video sessions. The research assistants were University students of Psychology experienced in data collection. The data was collected during the months of May 2020 to June 2020, using telephonic survey method, to observe physical distancing safety during coronavirus pandemic. Initially, we text messaged the entire contact list informing CHWs of research objectives, and seeking their permission for participation in the study (Delice & Practice, 2010). We followed-up with one text message when we did not receive a reply. A total of 373 CHWs replied and gave consent to be interviewed, and we were finally able to collect complete data from 350 women, making the final response rate for this study 35%. The responding CHWs belonged to 35 of the 36 Districts of Punjab, divided into North and South (Appendix B).

Data Analysis

We used SPSS 21.0 for analysis of descriptive statistics and bivariate regression (Bryman & Cramer, 2005). The independent variables for the study include: ‘coronavirus preparedness’, ‘coronavirus responsiveness’, and ‘employee satisfaction’; and the dependent variable for the study was: ‘satisfaction
with maternal and neonatal health services’. Reliability statistics for the scales in the study show good reliability above values of 0.71 (Terwee et al., 2007). The overall internal consistency ranged from 0.764 to 0.878 (Table 1). At first step descriptive statistics were derived. Then study variables were compounded to assess association between variables and linear regression was calculated in order to ascertain the direction of relationship.

Next, we calculated bivariate odds regression, by recoding study variables into binary categories. We created dummy variables with ‘0’ representing low odds of satisfaction and ‘1’ representing higher odds of satisfaction. Significance of the main effects was estimated by computing the confidence levels. P-values of less than 0.05 were considered significant for this study. For adjusted odds ratios, age and serving years, as continuous variables, were held constant. In the third phase of our analysis, the complex relationships among variables, as well as their determinants were calculated along with the parameter estimates of the structural model using a path diagram. The authors used AMOS software (version 17.0) for SEM analysis (Byrne, 2001), and entered coronavirus preparedness as the independent variable and satisfaction for maternal and neonatal health services as the dependent variable. Coronavirus responsiveness and employee satisfaction were entered at as mediating variables. We opted for maximum likelihood estimation method and performed the bootstrapping on 2000 samples with 90 percent confidence intervals.

| Variable                        | Cronbach Alpha | Items |
|---------------------------------|----------------|-------|
| Coronavirus preparedness        | 0.840          | 16    |
| Coronavirus responsiveness       | 0.878          | 11    |
| Employee satisfaction           | 0.764          | 13    |
| Maternal and neonatal health satisfaction | 0.810          | 11    |

### Results

#### Descriptive statistics

From a sample of 350 women, majority at 71.1% belonged to North Punjab, and were between the ages of 40–59 years. Most CHWs have secondary (grade 10) or intermediate level degrees (grade 12), 91.4%, and majority had been serving between 1–9 years. Most CHWs are married at 84.3% and have less than 3 children, at 64.6%.
Table 2
Socio-demographic characteristics of sample, N = 350

| Variable                                           | Frequency (%) |
|----------------------------------------------------|---------------|
| District                                           |               |
| North Punjab                                       | 249 (71.1%)   |
| South Punjab                                       | 101 (28.9%)   |
| Age                                                |               |
| 17–39                                              | 100 (28.6%)   |
| 40–59                                              | 250 (71.4%)   |
| Degree                                             |               |
| Secondary (grade 10)-Intermediate (grade 12)        | 320 (91.4%)   |
| Bachelors-Masters                                  | 30 (8.65)     |
| Serving years                                      |               |
| 01–19                                              | 254 (72.6%)   |
| 20–38                                              | 96 (27.4%)    |
| Marital status                                     |               |
| Married                                            | 295 (84.3%)   |
| Unmarried                                          | 55 (15.7%)    |
| Number of children                                 |               |
| Less than three                                    | 226 (64.6%)   |
| More than three                                    | 124 (35.4%)   |

Correlation and linear results

Table 3 presents the mean and standard deviations of study variables and the Pearson correlation results. All study variables have significant Pearson correlation associations, above cut-off values of 0.300 (Schober, Boer, & Schwarte, 2018), ranging from 0.304 to 0.768. Linear regression results showed that maternal and neonatal health satisfaction is positively associated with independent variables of: (i) coronavirus preparedness ($R^2 = 0.128$), (ii) coronavirus responsiveness ($R^2 = 0.122$), and (iii) employee satisfaction ($R^2 = 0.115$).
Table 3
Pearson Correlation results for study domain variables

|                                | Mean  | SD    | CP   | CR   | ES   | M&NHS |
|--------------------------------|-------|-------|------|------|------|-------|
| Coronavirus preparedness (CP)  | 67.48 | 6.881 | 1    |      |      |       |
| Coronavirus responsiveness (CR)| 45.09 | 5.497 | .717*| 1    |      |       |
| Employee satisfaction (ES)     | 53.08 | 7.690 | .578*| .689*| 1    |       |
| Maternal and neonatal health satisfaction (M&NHS) | 27.12 | 2.616 | .358*| .349*| .340*| 1     |

Socio-demographic regression results

In Table 4, we present the results for higher odds of CHWs satisfaction for maternal health services and neonatal health services with respect to socio-demographic characteristics. We found no significant associations.
Table 4
Bivariate regression results for lower odds of CHWs satisfaction for maternal health services and neonatal care services, with respect to socio-demographic characteristics

| Variable               | OR (CI) P-value | AOR* (CI) P-value |
|------------------------|-----------------|-------------------|
| District               |                 |                   |
| North Punjab           | 1.41 (0.82–2.43), 0.212 | 1.39 (0.81–2.41), 0.230 |
| South Punjab           | 0.212           | 0.230             |
| Degree                 |                 |                   |
| Secondary-Intermediate | 1.12 (0.46–2.73), 0.790 | 1.09 (0.44–2.66), 0.848 |
| Bachelors-Masters      | 0.790           | 0.848             |
| Marital status         |                 |                   |
| Married                | 2.05 (0.88–4.75), 0.092 | 2.18 (0.93–5.08), 0.071 |
| Unmarried              | 0.092           | 0.071             |
| Number of children     |                 |                   |
| Less than three        | 1.28 (0.75–2.17), 0.351 | 1.33 (0.77–2.29), 0.297 |
| More than three        | 0.351           | 0.297             |

*For adjusted odds ratio calculation age and service years, as continuous variables, have been kept constant

** P values are considered significant at less than < 0.05

Coronavirus preparedness regression results

With regard to results for adjusted odds ratio results for coronavirus preparedness (Table 5) we find that CHWs have lower odds of satisfaction with maternal and neonatal health services when they: (i) do not have all the information about coronavirus preparedness related to community needs (AOR: 8.20; 95% CI 3.09–13.74), (ii) do not know how to advise about distancing to minimize risks of community exposure (AOR: 5.33; 95% CI 1.16–9.56), (iii) do not have access to journal articles related to coronavirus preparedness (AOR: 5.31; 95% CI 2.84–9.90), (iv) do not know about decontamination procedures (AOR: 5.20; 95% CI 1.10–9.51), (v) are not familiar with the local emergency response for coronavirus (AOR: 3.70; 95% CI 1.82–7.53), (vi) are not prepared for the management of coronavirus (AOR: 3.68; 95% CI 1.97–6.87), (vii) do not have sufficient support from local officials in an emergency (AOR: 3.38; 95% CI 1.54–7.40), (viii) are not considered key leaders in the community in coronavirus outbreak (AOR: 2.98; 95% CI 1.65–5.39), (ix) do not have awareness of the programs about CP and management offered by the government (AOR: 2.69; 95% CI 1.47–4.93), (x) do not know who to contact from chain of command
in disaster situations (AOR: 2.19; 95% CI 1.13–4.21), and (xi) have not participated in emergency planning for coronavirus situations (AOR: 1.78; 95% CI 1.03–3.10).
Table 5
Bivariate regression results for lower odds of CHWs satisfaction for maternal health services and neonatal care services, with respect to coronavirus preparedness (CP)

| Variable                                                                 | OR (CI) P-value | AOR* (CI) P-value |
|--------------------------------------------------------------------------|-----------------|-------------------|
| Have all the information about CP related to my community needs          |                 |                   |
| No                                                                       | 8.02 (3.07–13.95), 0.000 | 8.20 (3.09–13.74), 0.000 |
| Yes                                                                      |                 |                   |
| Aware of the obstacles in CP related to community                        |                 |                   |
| No                                                                       | 1.09 (0.35–3.38), 0.873 | 1.04 (0.33–3.25), 0.937 |
| Yes                                                                      |                 |                   |
| Aware of educational classes on CP that relate to my community           |                 |                   |
| No                                                                       | 1.80 (0.93–3.46), 0.078 | 1.84 (0.95–3.55), 0.069 |
| Yes                                                                      |                 |                   |
| Aware of the programs about CP management by the government              |                 |                   |
| No                                                                       | 2.59 (1.43–4.70), 0.002 | 2.69 (1.47–4.93), 0.001 |
| Yes                                                                      |                 |                   |
| Have access to journal articles related to CP                            |                 |                   |
| No                                                                       | 5.38 (2.89–8.02), 0.000 | 5.31 (2.84–9.90), 0.000 |
| Yes                                                                      |                 |                   |
| Receive sufficient support from local officials in emergency             |                 |                   |
| No                                                                       | 3.39 (1.55–6.42), 0.002 | 3.38 (1.54–7.40), 0.002 |
| Yes                                                                      |                 |                   |
| Have contact of chain of command in disaster situations                 |                 |                   |
| No                                                                       | 2.14 (1.12–4.12), 0.021 | 2.19 (1.13–4.21), 0.019 |
| Yes                                                                      |                 |                   |
|                                                                 | Low odds of Satisfaction for Maternal & Neonatal Health Service |
|----------------------------------------------------------------|---------------------------------------------------------------|
| Have been participating in educational activities dealing with CP | 1.68 (0.84–3.34), 1.71 (0.86–3.42), 0.137, 0.123             |
| No                                                              | 0.137                                                         |
| Yes                                                             | 0.123                                                         |
| Have participated in emergency planning for coronavirus          | 1.75 (1.01–3.02), 1.78 (1.03–3.10), 0.044, 0.040             |
| No                                                              | 0.044                                                         |
| Yes                                                             | 0.040                                                         |
| Can take relevant exposure history before home visit             | 1.81 (0.75–4.37), 1.82 (0.75–4.43), 0.187, 0.181             |
| No                                                              | 0.187                                                         |
| Yes                                                             | 0.181                                                         |
| Aware of how to use personal protective equipment                | 1.88 (0.55–5.42), 1.74 (0.51–6.03), 0.314, 0.378            |
| No                                                              | 0.314                                                         |
| Yes                                                             | 0.378                                                         |
| I know how to execute decontamination procedures                | 5.10 (1.11–9.34), 5.20 (1.10–9.51), 0.035, 0.037            |
| No                                                              | 0.035                                                         |
| Yes                                                             | 0.037                                                         |
| I know how to advise about distancing to minimize exposure       | 5.11 (1.12–9.35), 5.33 (1.16–9.56), 0.036, 0.032            |
| No                                                              | 0.036                                                         |
| Yes                                                             | 0.032                                                         |
| I am familiar with the local emergency response system           | 3.54 (1.76–7.14), 3.70 (1.82–7.53), 0.000, 0.000            |
| No                                                              | 0.000                                                         |
| Yes                                                             | 0.000                                                         |
| I am considered a key leader in my community                     | 2.93 (1.63–5.27), 2.98 (1.65–5.39), 0.000, 0.000            |
| No                                                              | 0.000                                                         |
| Yes                                                             | 0.000                                                         |
| I consider myself prepared for the management of coronavirus | Low odds of Satisfaction for Maternal & Neonatal Health Service |
|-----------------------------------------------------------|---------------------------------------------------------------|
| I consider myself prepared for the management of coronavirus | 3.70 (2.01–6.83), 3.68 (1.97–6.87), 0.000 0.000 |

*For adjusted odds ratio calculation age and service years, as continuous variables, have been kept constant

** P values are considered significant at less than < 0.05

**Coronavirus responsiveness regression results**

Adjusted odds ratio results for coronavirus responsiveness (Table 6) show that CHWs have lower odds of satisfaction with maternal and neonatal health services when they: (i) are not familiar with the scope of their role in coronavirus (AOR: 5.60; 95% CI 2.14–9.65), (ii) are not confident in their abilities in coronavirus as a member of a healthcare team (AOR: 5.16; 95% CI 2.51–7.62), (iii) are not confident in their abilities as a direct care provider or first responder in coronavirus (AOR: 2.85; 95% CI 1.49–5.45), (iv) cannot manage the common symptoms and reactions of coronavirus (AOR: 2.51; 95% CI 1.45–4.34), (v) are not confident implementing plans for social distancing, infection control, hygiene literacy, & similar functions (AOR: 2.45; 95% CI 1.10–5.47), (vi) cannot identify possible indicators of mass exposure evidenced by a clustering of patients with similar symptoms (AOR: 2.79; 95% CI 1.39–5.57), (vii) as HCPs, do not feel confident as a manager or coordinator of a community exposed to coronavirus (AOR: 3.14; 95% CI 1.44–6.83), (viii) are not provided opportunities to participate in peer evaluation of skills and governance planning on coronavirus (AOR: 3.50; 95% CI 1.49–8.23), (ix) are not accepted as a legitimate authority for coronavirus awareness/ prevention in the community (AOR: 3.43; 95% CI 1.91–6.15).
| Variable                                                                 | OR (CI) P-value | AOR* (CI) P-value |
|-------------------------------------------------------------------------|-----------------|------------------|
| I am familiar with the scope of my role as a healthcare provider        | 5.73 (2.21–9.84), 0.000 | 5.60 (2.14–9.65), 0.000 |
| No                                                                      |                 |                  |
| Yes                                                                     | 0.000           | 0.000            |
| I am confident in my abilities as a member of a healthcare team          | 5.14 (2.51–7.52), 0.000 | 5.16 (2.51–7.62), 0.000 |
| No                                                                      |                 |                  |
| Yes                                                                     | 0.000           | 0.000            |
| I am confident as a direct care provider or first responder in coronavirus | 2.86 (1.51–5.39), 0.001 | 2.85 (1.49–5.45), 0.001 |
| No                                                                      |                 |                  |
| Yes                                                                     | 0.001           | 0.001            |
| I can care for coronavirus patients independently without any supervision | 1.59 (0.99–2.69), 0.081 | 1.60 (0.94–2.72), 0.080 |
| No                                                                      |                 |                  |
| Yes                                                                     | 0.081           | 0.080            |
| I can manage the common symptoms and reactions of coronavirus           | 2.47 (1.44–4.24), 0.001 | 2.51 (1.45–4.34), 0.001 |
| No                                                                      |                 |                  |
| Yes                                                                     | 0.000           | 0.001            |
| I feel confident implementing plans for social distancing, infection control, hygiene literacy, & similar functions | 2.31 (1.04–5.11), 0.038 | 2.45 (1.10–5.47), 0.028 |
| No                                                                      |                 |                  |
| Yes                                                                     | 0.038           | 0.028            |
| I can identify possible indicators of mass exposure evidenced by a clustering of patients with similar symptoms | 2.71 (1.36–5.39), 0.005 | 2.79 (1.39–5.57), 0.004 |
| No                                                                      |                 |                  |
| Yes                                                                     | 0.000           | 0.004            |
| Low odds of Satisfaction for Maternal & Neonatal Health Service |  
| As a HCP, I would feel confident as a manager or coordinator of a community exposed to coronavirus |  
| No | 2.99 (1.39–6.43), 0.005 | 3.14 (1.44–6.83), 0.004 |
| Yes | 0.005 | 0.004 |
| I am provided opportunities to participate in peer evaluation of skills and governance planning on coronavirus |  
| No | 3.46 (1.48–8.09), 0.004 | 3.50 (1.49–8.23), 0.004 |
| Yes | 0.004 | 0.004 |
| I am familiar with how to perform focused health assessment for coronavirus |  
| No | 1.89 (0.96–3.73), 0.063 | 1.88 (0.95–3.72), 0.068 |
| Yes | 0.063 | 0.068 |
| I am accepted as a legitimate authority for coronavirus awareness/prevention in the community |  
| No | 3.40 (1.90–6.08), 0.000 | 3.43 (1.91–6.15), 0.000 |
| Yes | 0.000 | 0.000 |

*For adjusted odds ratio calculation age and service years, as continuous variables, have been kept constant
**P values are considered significant at less than < 0.05

Employee satisfaction regression results

Adjusted odds ratio results for employee satisfaction (Table 7) show that CHWs have lower odds of satisfaction with maternal and neonatal health services when: (i) working relationship with coworkers is not good (AOR: 11.59; 95% CI 3.55–18.78), (ii) supervisors do not treat them with respect (AOR: 7.94; 95% CI 2.30-14.38), (iii) they do not believe their profession is a good place to work (AOR: 5.97; 95% CI 2.17–8.39), (iv) communication between senior leadership and employees is not good (AOR: 5.00; 95% CI 2.39–8.48), (v) supervisors do not work well with employees of different backgrounds (AOR: 4.42; 95% CI 1.42–8.72), (vi) they are not provided opportunities to demonstrate their leadership by supervisor (AOR: 3.63; 95% CI 1.82–7.21), (vii) supervisors do not support employee development (AOR: 3.49; 95% CI 1.66–7.33), (viii) supervisor do not support balance in work and family issues (AOR: 2.96; 95% CI 1.69–5.19), (ix) job security and contract is not satisfactory (AOR: 2.49; 95% CI 1.46–4.26), (x) they cannot learn from
coworkers as they do their work (AOR: 1.99; 95% CI 1.01–3.94).
| Variable                                      | Low odds of Satisfaction for Maternal & Neonatal Health Service | OR (CI) P-value | AOR* (CI) P-value |
|-----------------------------------------------|---------------------------------------------------------------|----------------|------------------|
| My profession is a good area to work in       |                                                               |                |                  |
| No                                            | 5.89 (2.16–8.06), 0.001                                        | 5.97 (2.17–8.39), 0.001 |
| Yes                                           | 0.001                                                         | 0.001          |
| Coworkers & I have a good working relationship|                                                               |                |                  |
| No                                            | 11.64 (3.59–18.75), 0.000                                      | 11.59 (3.55–18.78), 0.000 |
| Yes                                           | 0.000                                                         | 0.000          |
| Supervisor treats me with respect             |                                                               |                |                  |
| No                                            | 8.09 (2.36–14.66), 0.000                                       | 7.94 (2.30–14.38), 0.000 |
| Yes                                           | 0.001                                                         | 0.001          |
| Supervisor provides me with opportunities to demonstrate my leadership | 3.63 (182–7.21), 0.000 | 3.63 (1.82–7.21), 0.000 |
| No                                            | 0.000                                                         | 0.000          |
| Yes                                           |                                                               |                |                  |
| Workload is reasonable                        |                                                               |                |                  |
| No                                            | 1.20 (0.72–2.01), 0.468                                       | 1.20 (0.72–2.01), 0.480 |
| Yes                                           | 0.468                                                         | 0.480          |
| Supervisor supports my need to balance work and family issues | 2.81 (1.63–4.86), 0.000 | 2.96 (1.69–5.19), 0.000 |
| No                                            | 0.000                                                         | 0.000          |
| Yes                                           |                                                               |                |                  |
| Employees learn from one another as they do their work | 1.96 (0.99–3.87), 0.050 | 1.99 (1.01–3.94), 0.047 |
| Supervisors in my work unit support employee development | Low odds of Satisfaction for Maternal & Neonatal Health Service |
|----------------------------------------------------------|---------------------------------------------------------------|
| No | 3.36 (1.61–7.01), 0.001 | 3.49 (1.66–7.33), 0.001 |
| Yes | | |

| Supervisors work well with employees of different backgrounds | Low odds of Satisfaction for Maternal & Neonatal Health Service |
|---------------------------------------------------------------|---------------------------------------------------------------|
| No | 4.61 (1.50–8.17), 0.008 | 4.42 (1.42–8.72), 0.010 |
| Yes | | |

| Communication between senior leadership and employees is good | Low odds of Satisfaction for Maternal & Neonatal Health Service |
|---------------------------------------------------------------|---------------------------------------------------------------|
| No | 5.11 (2.45–8.62), 0.000 | 5.00 (2.39–8.43), 0.000 |
| Yes | | |

| Creativity and innovation are rewarded | Low odds of Satisfaction for Maternal & Neonatal Health Service |
|----------------------------------------|---------------------------------------------------------------|
| No | 1.02 (0.58–1.78), 0.935 | 1.01 (0.57–1.79), 0.958 |
| Yes | | |

| Pay and employment benefits are reasonable | Low odds of Satisfaction for Maternal & Neonatal Health Service |
|-------------------------------------------|---------------------------------------------------------------|
| No | 1.09 (0.65–1.81), 0.738 | 1.10 (0.66–1.84), 0.699 |
| Yes | | |

| Job security and contract is reasonable | Low odds of Satisfaction for Maternal & Neonatal Health Service |
|----------------------------------------|---------------------------------------------------------------|
| No | 2.47 (1.45–4.20), 0.001 | 2.49 (1.46–4.26), 0.001 |
| Yes | | |

*For adjusted odds ratio calculation age and service years, as continuous variables, have been kept constant

** P values are considered significant at less than < 0.05

** Structural Equation Model

Our SEM results for model fit, presented in Table 8, show that all fit indices are within the acceptable limit: [GFI = .998; AGFI = .977; CFI = .999; TLI = .993; RMSEA = .042].

Table 8:

Model fit indices for SEM
Results presented in Table 9 show that coronavirus preparedness has a direct effect on maternal health satisfaction ($\beta = .242, p < .001$) and an indirect effect on maternal health satisfaction ($\beta = .242, p < .001$) via the mediation of employee satisfaction. Coronavirus responsiveness does not have any direct effect on maternal health satisfaction, whereas coronavirus responsiveness has an indirect effect on maternal health satisfaction ($\beta = .113, p < .001$) via the mediation of employee satisfaction. Coronavirus preparedness has a direct effect ($\beta = .173, p < .001$) and also an indirect effect ($\beta = .405, p < .001$) on employee satisfaction via the mediation of coronavirus responsiveness. SEM results are summarized in Fig. 1.

Table 9:

Direct and indirect effects of independent and mediating variables on maternal health satisfaction

| Model                          | Direct Effects | Indirect Effects | Total Effects |
|--------------------------------|----------------|------------------|---------------|
| CR Preparedness CR Responsiveness | $\.717^{***}$  | $\.405^{***}$ | $\.578^{***}$ |
| CR Preparedness Employee Satisfaction | $\.173^{***}$  | $\.116^{***}$ | $\.358^{***}$ |
| CR Preparedness Maternal Health Satisfaction | $\.242^{***}$  | $\.242^{***}$ | $\.242^{***}$ |
| CR Responsiveness Employee Satisfaction | $\.564^{***}$  | $\.564^{***}$ | $\.564^{***}$ |
| CR Responsiveness Maternal Health Satisfaction | $\.113^{***}$  | $\.113^{***}$ | $\.113^{***}$ |
| Employee Satisfaction Maternal Health Satisfaction | $\.200^{***}$  | $\.200^{***}$ | $\.200^{***}$ |

Discussion
Our study variables show linear association, providing evidence that when coronavirus preparedness, coronavirus responsiveness and employee satisfaction are high, CHWs perceive their delivery of maternal and neonatal services to be better. Bivariate regression results addressing our four research questions imply considerable policy improvement is needed for CHWs with regard to preparedness and response for infection control and general employee support. Our first research question examined a relationship between socio-demographic variables and lower odds of satisfaction with maternal and neonatal services. The results of the data analysis reveal no significant associations.

The second research question tested the relationship between coronavirus preparedness and lower odds of satisfaction with maternal and neonatal services. We found that CHWs have lower odds of satisfaction when they lack information and education, and training programs by the government. Specifically, CHWs have lower satisfaction when they are not trained about how to guide mothers about physical distancing, decontamination, and disinfection procedures. There is also lower satisfaction when there is inadequate support from local officials and lack of information about local emergency response and who to contact during emergencies. Other research confirms that maternal health indicators show improvement when the state invests in the training and skill development of primary healthcare workers (Scott et al., 2018). Coordination and collaboration with cross-sector partners in the community is vital for emergency response and effective service delivery (Ransom, Goodman, & Moulton, 2008). Information sharing about local health teams and effective communication between health teams is vital for optimal delivery of services by CHWs. We also found that lower probability of satisfaction is associated with CHWs lack of acceptance as key leaders by the community. Local research suggests that CHWs face considerable resistance in certain communities due to patriarchal and traditional forces which prefer local healers (Jafree, 2018).

The third research question examined the relationship between coronavirus responsiveness and lower odds of satisfaction with maternal and neonatal services. Findings revealed that CHWs have lower odds of satisfaction when they are not confident about their exact role and abilities to identify patients and manage coronavirus in the community. Other research confirms that CHWs need formal training about their roles and responsibilities for coronavirus management (Ajisegiri, Odusanya, & Joshi, 2020). We also found that lower probabilities for satisfaction were linked with specific problems related to management of symptoms, implementing social distancing, infection spread, and hygiene literacy. Unless CHWs have training for coronavirus symptom management and infection control within communities there is greater risk of disease spread in disadvantaged communities (Perry, Zulliger, & Rogers, 2014). We also found that the odds of satisfaction were low when CHWs are not provided opportunities to participate in peer evaluation of skills and governance planning on coronavirus. Other scholarship highlights that when CHWs participate in peer evaluation and governance, there is improved service quality for maternal and child health in the primary health sector (Kaplan, Dominis, Palen, & Quain, 2013).

The fourth research question examined the relationship between employee satisfaction and lower odds of satisfaction with maternal and neonatal services. Results reveal that CHWs have lower odds of satisfaction when they do not have a good working relationship with their coworkers and are unable to
learn from each other. Prior research has reported that coworkers can assist in supporting CHWs in dealing suitably with local issues and improving services (Sharma, Webster, & Bhattacharyya, 2014). Satisfaction is also low when supervisors are disrespectful, communication is inadequate, skill development and leadership is not supported, and work-family balance is not reinforced. Other scholarship confirms that supervisor support is essential for CHW service quality, employee outcomes, and stability in family and work equation (Jaskiewicz & Tulenko, 2012). Lastly, we found that the odds of satisfaction are low when there is job insecurity and contract is inadequate. Local research shows that there is need for CMWs contracts to be improved with regard to matching income with inflation and improving their career path and professional advancement (Haq, Iqbal, & Rahman, 2008).

With regard to our fifth research question, examining if coronavirus responsiveness and employee satisfaction as mediating variables influence the relationship between coronavirus preparedness and maternal and neonatal health service, we were able to conclude two important things. Firstly, coronavirus preparedness has a significant effect on maternal and neonatal health services, and this relationship is mediated significantly by employee satisfaction. Coronavirus preparedness also has a direct effect and indirect effect on employee satisfaction via the mediation of coronavirus responsiveness. We may derive that even when CMWs are prepared for infection control and management, their response may not be optimal, unless they have organizational, supervisor, and coworker support (Cometto et al., 2018; Jaskiewicz & Tulenko, 2012; Rabbani, Shipton, et al., 2016). Secondly, we found that coronavirus responsiveness has an indirect effect on maternal and neonatal health services via the mediation of employee satisfaction. The results confirm that employee satisfaction is a key factor in securing delivery services during emergency and crisis situations in the community, including pandemics (Zhang et al., 2016).

**Limitations of study**

The limitations of this research include the cross-sectional design and the inability to sample more provinces. However, Punjab comprises 60% of the Pakistani population and has greater CHW deployment compared to other provinces in the country, thus lending strength to our study in terms of representation (Oxford Policy Management, 2002). The findings of this research have import in providing recommendations and impetus for improving (i) primary-level maternal and neonatal healthcare services for women of Pakistan, (ii) service quality, training, and employee support of CHWs, and (iii) coronavirus preparedness and response protocols for CHWs. We believe this research is relevant for the coronavirus pandemic, but will hold value as a contribution for research-based recommendations for future pandemics as well. In addition, the findings have relevancy for other developing countries planning a CHW programme to support disadvantaged women with primary health services. Stemming from the findings of this study, a randomized controlled trial for digital healthcare services for women in communities is being conducted by the first author of this study. Future researchers might want to plan mixed methods research and case studies.
Concluding Recommendations

CHWs can play a critical role in controlling infection and also protecting mothers and newborn during pandemics. Pakistan is lucky to have an existing CHW programme across the country, which is managed by The Ministry of National Health Services, Regulation and Coordination and the provincial health bodies responsible for community health services. The findings of our study enable us to inform about the needs of CMWs in delivering optimal services for maternal and neonatal health during pandemics. Our recommendations are beneficial for other developing regions planning community health services for maternal and neonatal health for disadvantaged women during pandemics. We conclude with four key areas for support to improve maternal and neonatal health services by CMWs during times of pandemics (Table 10).

1. Education and Training- is critically needed to improve skill-sets for management of coronavirus in the community, identification of mass exposure, and development of confidence levels in CMWs as pandemic coordinators. There is also need to provide access to understandable academic material and recent scholarship related to pandemic management and infection material in CMWs who are mostly secondary school graduates and are not highly educated.

2. Operational Support- is needed to provide clear guidelines for roles and responsibilities during pandemics, and for the introduction of routine practice for pandemic management. We also recommend the formation of and regular participation in committees for emergency response and infection control and regular meetings with local officials and community health worker teams for improved coordination and pandemic response. 3. Public Acceptance- it is essential that there is community acceptance of CMWs as legitimate authorities and key leaders for infection control for the effectiveness of service delivery. This is possible through social media and community awareness drives by established community notables like religious leaders, elected political leaders, and older and trusted male populations within the local districts.

4. Employee Support and Benefits- we recommend consistent accountability measures of supervisors to prevent disrespect, bullying and discrimination. There is also need for increased communication and team-building initiatives with coworkers in the primary healthcare sector, such as the medical officer in charge, lady health visitor, vaccinators, community midwives, traditional birth attendants, medical technicians and dispensers, district health officer, and lady health supervisor. Opportunities for employee development and leadership are also needed, along with support for work-family balance in order to make service delivery more optimal. Finally, there is need for reforms with regard to job stability and career progression.
**Table 10**  
Summary recommendations to help improve maternal and neonatal health services of CHWs during pandemics

| **Education and Training** |
|----------------------------|
| Improve skill-set for:     |
| - direct care or first response in coronavirus, |
| - management of the common signs and symptoms of coronavirus, |
| - decontamination procedures and |
| - how to provide advice about social distancing to minimize risks of community exposure |
| - information related to specific community needs |
| Develop proficiencies for identification of mass exposure |
| Improve confidence as a manager or coordinator of a community exposed to coronavirus |
| Increasing access to easy to understand educational material related to management of coronavirus management and infection control |

| **Operational Support** |
|-------------------------|
| Provision of role descriptions with sufficient detail about the scope of role during pandemic |
| Routine practice for implementing plans for pandemic management, including: social distancing, infection control, hygiene literacy, & similar functions |
| Formation and regular participation in: |
| - An advisory committee for an emergency response system for pandemics |
| - A committee for governance planning on coronavirus/ infection control |
| - Government programs about coronavirus management |
| Regular meetings and coordination for: |
| - Peer evaluation of skills and challenges |
| - Identification of community/ local officials support system and chain of command in an emergency |

| **Public Acceptance** |
|-----------------------|
| Improve community acceptance of CMWs as legitimate authority for coronavirus awareness and prevention |
| List and advertise CMWs as key leaders in the community for infection control and management |

| **Employee Support & Benefits** |
|-------------------------------|
| Accountability of CHW supervisor treatment, discrimination, and bullying |
| Superior-subordinate meeting forums for improved communication |
Education and Training

|                |                                                                 |
|----------------|-----------------------------------------------------------------|
|                | Team building exercises with coworkers, offering opportunities  |
|                | to learn from each other                                        |
|                | Introducing opportunities for CHW development and leadership    |
|                | Support for work family balance                                 |
|                | Job security and introduce a career progression framework for  |
|                | them                                                            |

Declarations

Ethics approval and consent to participate:

Ethics approval for this study was taken from the Institutional Review Board, Forman Christian College University. A cover letter was provided to CHWs describing the study and informed consent was taken from all respondents.

Consent for publication:

All authors have consented and agreed on final version of this submission.

Availability of data and material

The data set has been attached as a supplementary SPSS file.

Competing interests

The authors have no competing interests to declare.

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No funding was received for this study.

Authors' contributions

SRJ has drafted the project, collected the data, analyzed it, and prepared the manuscript. AUM and AM assisted in data collection. QKM assisted in data analysis. All authors approved the final manuscript.

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**Figures**
**Figure 1**

The structural path model for study variables

**Supplementary Files**

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- AppendixB.docx
- 786.AppendixA.docx