ORIGINAL ARTICLE

HEALTH SERVICES IN THE WORLD HEALTH ORGANIZATION MULTICOUNTRY SURVEY PAKISTAN AND ITS ASSOCIATION WITH MATERNAL AND NEW-BORN OUTCOME

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Background: WHO MCS in 2011 evaluated the incidence and management strategies linked with maternal and neonatal mortality in facilities across 26 countries including Pakistan. This study, a sub-analysis assessed the availability of essential obstetric and newborn care at referral level facilities of Pakistan that were selected for WHO MCS to correlate it with maternal and neonatal outcomes. **Methods**: This cross-sectional study assessed the infrastructure, equipment and services in 16 referral level government hospitals participating in WHO MCS from 1st March to 30th May, 2011. The association was found between this data and maternal & neonatal outcomes of each facility using chi square test. **Results**: The studied facilities had basic infrastructure, most components of Essential Maternal and Neonatal Obstetric Care services with part time/full time availability of obstetricians, anaesthetists and paediatricians. Adult intensive care unit was available in 68%, and neonatal intensive care unit was available in half of the facilities. The incidence of severe maternal outcomes had a positive correlation with presence of adult intensive care unit, mechanical ventilator and twenty-four hours (24/7) availability of anaesthesiologist, nurses & paramedics. The neonatal mortality was also higher in facilities with neonatal intensive care unit facility. **Conclusion**: Most components of Essential Maternal and Neonatal Obstetric Care were present in the studied facilities. Tertiary level facilities even with availability of Adult and neonatal intensive care units had more adverse maternal and new-born outcomes perhaps due to more disease burden.

Keywords: EMONC; facility; Severe maternal outcome; Maternal mortality; Perinatal mortality

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INTRODUCTION

Pakistan, the sixth most populous country in the world has high maternal and perinatal mortality rate.[1,2] In 2015, 9700 maternal deaths were reported.[2] Pakistan is one of the ten countries contributing to 59% of maternal deaths worldwide.[2] Neonatal outcomes and maternal health are interconnected. The quality of care received by mothers during antenatal, intrapartum and immediate postpartum period influences the health of both mothers and their babies.[3]

Facility delivery has been associated with better maternal and neonatal outcomes.[4] In Pakistan only 48% percent births take place in health facilities. Among these women, 15 percent are delivered in public sector facilities and 33 percent in private facilities.[1] A three tier network of public healthcare facilities was initiated several decades ago throughout Pakistan to provide healthcare up to the remotest areas. The Primary Health Care (PHC) facilities comprises of Basic Health Units (BHU) and Rural Health Centres (RHC). The secondary level comprises of Tehsil Headquarters hospitals (THQ) accommodating population at sub district level and District Headquarters hospitals (DHQ) catering to the district population. Tertiary health care facilities are located in the cities and majority also serve as teaching hospitals.[5] Many studies have reported that several components of obstetric care are missing at various levels leading to improperly managed patients being referred to tertiary care level hospitals in moribund state with multiorgan failure jeopardizing lives and health of both mothers and their babies.[6–8]

The World Health Organization (WHO) conducted a multi country Survey (WHO MCS) in 2011 to evaluate the incidence and management strategies linked with maternal and neonatal mortality in a worldwide network of health facilities across 26 countries including Pakistan.[9]

This study, a sub-analysis of WHO MCS was undertaken to evaluate the availability of essential and comprehensive obstetric care facilities in the participating hospitals of WHO MCS and its association with maternal and neonatal morbidity.

MATERIAL AND METHODS

This study was a sub-analysis of WHO MCS. It's a cross sectional survey of sixteen referral level government health care facilities from the federal capital Islamabad and provinces of Sind and Punjab, undertaken from 1st March to 30th May, 2011. These 16 facilities were selected by WHO for the WHO MCS. Criteria for facility selection were ≥1000 deliveries annually and capacity to perform caesarean section.[9] The institutions were randomly selected through a stratified multistage cluster sampling technique from a list provided by the Pakistan Federal Maternal Neonatal and Child Health cell. All women giving birth at participating facilities and those admitted within seven days postpartum or post abortion during the study period with near miss maternal mortality were included.

Hospital coordinators from each facility filled an institutional form regarding hospital structure and various facilities available in the hospital. In the selected facilities, the maternal and neonatal outcome of eligible women during the study period was entered into another individual form. This was subsequently entered online at central office in Islamabad for analysis at WHO Geneva. The study was started after approval from WHO ethical committee in Geneva as well as national bioethics committee at Pakistan Medical and research Council (PMRC) Pakistan.

The frequency of Severe Maternal Outcome (SMO) and maternal complications per facility were determined. SMO was defined as maternal deaths plus near miss maternal mortality.[9] The level of maternal and new-born care provision in the 16 selected health facilities was assessed for its infrastructure, access to intensive care unit, provision of screening and diagnostic tests, availability of qualified staff. Associations of severe maternal outcome and neonatal outcomes with the availability of resources in the facilities and of Emergency obstetric staff, availability of adult and neonatal Intensive care units and level of facility were determined by using chi square test (significance level $p< 0.05$) using SPSS-18.

RESULTS

Of the 16 facilities participating in the survey, 6 (37.5%) were secondary care facilities and 10 (62.5%). were tertiary care facilities (Table-1). Two facilities were from Federal capital Islamabad, 7 from the province of Sindh (including 5 in urban and 2 in peri-urban areas) and 7 from the Punjab province (5 urban and 2 peri-urban areas).

Total number of obstetrics and gynaecology beds in the studied facilities ranged from 10 to 312 in number. During the study period, 13175 women were studied. Among these 13122 delivered in a participating facility. Fifty-three patients were admitted with a severe pregnancy complication. The largest number of obstetric patients, i.e., 3581 were managed in 312 bedded, Rawalpindi Medical College (RMC) and allied hospitals followed by 1,706 in 125 bedded PIMS and 1,204 in the Qatar hospital Karachi with 55 beds. The least number of obstetric patients, 151 were managed in the 12 bedded Civil hospital Jacobabad followed by 161 Taluka hospitals, Rohri with 11 beds. On average, secondary health facilities attended to fewer patients than tertiary care facilities (table 2). Of total patients, 11227 (86%) were managed in tertiary health care facilities with average number of beds were 128 whereas 1848 (14%) were managed in secondary facilities with mean of 14 beds.

Basic facilities like electricity, generator, ambulance and sewerage system were available in all the facilities. Telephone was available in 14 (87.5%), internet in 10 (62.5%) and incinerator in 6 (37.5%) of the facilities. Blood bank was available in 15 facilities (94%). That is all tertiary and five secondary level facilities. Screening tests for Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV), syphilis was available in 9 (56.3%) of settings which were all tertiary level hospitals. Adult intensive care unit (ICU) was available in 10 (62.5%) of facilities. None of the secondary care facilities had adult ICU while all the tertiary care facilities had adult ICU. Neonatal ICU was available in 7 (43.8%) facilities, that is 70% of tertiary and none of secondary level hospitals. New-born incubator was available in 8 (50%) of the hospitals, all of which were tertiary level facilities. However basic radiological and pathology facilities were available in all the hospitals.

Services uniformly available in all the facilities were administration of parenteral antibiotics and oxytocin, removal of retained products of conception, vacuum extraction and forceps delivery, blood transfusion, hysterectomy, oxygen supplementation by mask or catheter and neonatal resuscitation. The administration of misoprostol and other uterotonics was available in 15 (94%) facilities that is all tertiary level hospitals and 5 (83%) secondary level facilities. Magnesium Sulphate was available in 13 (81.3%) facilities that is in all tertiary level hospitals and 3 (50%) secondary level hospitals. Mechanical ventilation was available in 9 (56.5%) which were

all tertiary level hospitals. Dialysis was available in 14 (87.5%) facilities, that is in all tertiary level and 4 (66.6%) secondary level hospitals. Among the important laboratory tests for critical patients, coagulation tests were conducted in 14 (87.5%), blood gas analysis/gasometry was available in 8 (50%) and lactate in 3 (18.8%) facilities.

As regards the availability of health professionals, obstetricians were present round the clock in 10 (62.5%) hospitals, that is in all the tertiary care facilities and were on call in 6 (37.5%) hospitals which were all secondary care facilities. Paediatricians were present round the clock in 6 (37.5%) facilities, on call in 8 (50%) and part time in 2 (12.5%) facilities. Critical care specialist was not available in 4 (26%) facilities and internal medicine specialist was not available in 1 (6%) facilities. Anaesthesiologist were available round the clock in 9 (56%), on call in 6 (37.5%) and part time in 1 (6%) facility. all tertiary level hospitals had around the clock availability of anaesthetists except Sobhraj hospital where anaesthetist was on call. Five secondary level hospitals had on call anaesthetist while one had an anaesthetist available in morning shift only. Twelve (75%) facilities had round the clock availability of nurses & paramedic. Out of these 10 were tertiary level facilities and 2 were secondary level hospitals.

The tertiary level hospitals managed and delivered 86% of the total patients in the study period. The mean incidence of severe maternal outcome (maternal deaths+maternal near miss) was 8.25 ranging from 0–34. Complications related with pregnancy, childbirth, postpartum or abortion were 72.3 per facility ranging from 0-293, with lowest levels in Taluka Hospital Rohri- a secondary facility and highest in Rawalpindi Medical College(RMC) & allied hospitals- a tertiary care facility. (Table 2). Ninety four percent of the maternal severe outcome occurred in in tertiary care facilities which was significantly higher than 6.1% in secondary level hospitals (p-value =0.012). Similarly, maternal complications were significantly higher in the tertiary care facilities at 98.2% as compared to 1.8% in secondary care facilities (p-value=0.0001) (Table-3). The incidence of severe maternal outcome was significantly higher in the facilities where adult ICU was available, i.e., 90% versus 10% (p-value of 0.006) and where mechanical ventilation was available. i.e., 85.6% versus 14.4 % (p-value=0.01). Severe maternal outcome was significantly higher in facilities where anaesthetist was available round the clock 85.6% versus 14.4% (p-value=0.01) and where nursing and paramedical staff was available, i.e., 94% versus 6% (p-value=0.03). (Table-4). No association of severe maternal outcome and neonatal outcome was found with availability of gynaecologist and paediatrician.

Use of misoprostol, other uterotonics and magnesium sulphate and dialysis were not significantly associated with severe maternal outcome. Similarly, laboratory tests like blood gas analysis, creatinine, bilirubin, lactate, screening of blood donor for HIV, HBV, syphilis and radiological services had no association with severe maternal outcome. Perinatal mortality rate was 17.1/1000 births per facility ranging from 0 to 30/1000. Perinatal mortality was higher in tertiary care facilities (22.9 / 1000 births) as compared to secondary care facilities (7.5 / 1000 births) (Table-2). Statistical analysis showed that perinatal mortality was significantly higher in the facilities where neonatal intensive care unit was available, i.e., 219 (74.7%) vs 74 (25.3 %) p-value= 0.01. (Table-5).

Table-1: Hospitals included in WHO multicountry survey

Province	Level of facility	Participating hospitals
Federal	Tertiary	• PIMS [a] • FGSH[b]
Punjab	Tertiary	• RMC[c] & allied hospitals • Services Hospital Lahore • Sheikh. Zayed Hospital Lahore • Bahawalpur Victoria Hospital • Nishtar Hosiptal Multan
	Secondary	• DHQ Hospital Toba TeK Singh[d] • THQ Hospital Muredke[e]
Sindh	Tertiary	• Civil Hospital Karachi • Qatar Hospital Karachi • Sobhraj Hospital Karachi
	Secondary	• Korangi Hospital Karachi • Civil Hospital Jacobabad • Civil Hospital Badin • Taluka Hospital Rohri

a. Pakistan institute of medical sciences. b. Federal Government Services Hospital. c. Rawalpindi Medical College & Allied Hospital. d. District Headquarter Hospital. e Tehsil Headquarter hospital

Table-2: Distribution of beds, Severe Maternal Outcome (SMO) & perinatal mortality according to level of facility

Hospital	No of beds	Total patients managed n=13175 n (%)	Severe Maternal outcome n=132	Maternal complications n=1158	Peri-natal mortality rate/1000 births
PIMS(tertiary)	125	1706 (12.9)	(4.5)	29 (2.5)	20
FGSH(tertiary)	150	931 (7)	3 (2.3)	23 (2)	30
RMC & Allied Hospitals (tertiary)	312	3581 (27)	34 (25.8)	293 (25.3)	30
Services Hospital Lahore (tertiary)	125	371 (2.8)	1 (0.8)	10 (0.9)	19.2
Shiekh Zayed Hospital Lahore (tertiary)	25	364 (2.7)	1 (0.8)	60 (5.2)	10
Bahawalpur Victoria Hospital (tertiary)	120	962 (7.3)	25 (18.9)	159 (13.7)	30
Nishtar Hospital Multan (tertiary)	194	622 (4.7)	30 (22.7)	75 (6.5)	30
Civil Hospitl Karachi(tertiary)	65	763 (5.8)	13 (9.8)	52 (4.5)	30
Qatar Hospital Karachi (tertiary)	55	1204 (9)	6 (4.5)	155 (13.4)	20
Sobhraj Hospital Karachi (tertiary)	110	823 (6.2)	5 (3.8)	16 (1.4)	10
Korangi Hospital Karachi (secondary)	20	497 (3.8)	0	4 (0.3)	0
Civil Hospital Jacobabad (secondary)	12	151 (1)	(0.8)	2 (0.2)	10
Civil Hospital Badin (secondary)	20	369 (2.8)	0	2 (0.2)	2.92
Taluka Hospital Rohri (secondary)	11	161 (1)	0	0	20
DHQ Toba Tek Singh (secondary)	16	349 (2.6)	7 (5.3)	12 (1)	9.1

Table-3: Level of facility & association with maternal complications &severe maternal outcome

Level of facility	No of patients managed n =13175	SMO n=132	*p*-value	Maternal complication n=1158	*p*-value
Secondary	1848 (14%)	8 (6.1%)	0.012	21 (1.8%)	0.0001
Tertiary	11327 (86%)	124 (94%)		1137 (98.2%)	

Table-4: Availability of services at the studied facilities & association with severe maternal outcome

Services		Facilities n=16	SMO n =132	*p*-value
Adult Intensive care unit	Yes	10 (62.5%)	119 (90%)	0.006
	No	6 (37.5%)	13 (10%)	
Mechanical Ventilation	Yes	9 (56%)	113 (85.6%)	0.01
	No	7 (44%)	19 (14.4%)	
Round the clock Availability of anaesthesiologist	Yes	9 (56%)	113 (85.6%)	0.01
	No	7 (44%)	19 (14.4%)	
Round the clock availability of nurse/paramedics	Yes	12 (75%)	124 (94%)	0.03
	No	4 (25%)	8 (6%)	

Table-5: Association of neonatal mortality with availability of neonatal intensive care unit

Neonatal Intensive Care Unit	Facilities n=16	Neonatal Mortality n=293	*p*-value
Available	7 (43.8 %)	219 (74.7%)	0.01
Not available	9 (56.3 %)	74 (25.3 %)	

DISCUSSION

Most obstetric complications usually occur during labour or in early post-partum period.[10] Reduction in maternal mortality & morbidity is possible if health services are available to all throughout pregnancy, childbirth and postpartum period.[10,11]

Most of the essential obstetric and new-born care (EMNOC) & Comprehensive essential obstetric care services were available at all the selected Pakistani secondary & tertiary level facilities in WHO Multicountry Survey. However, a study conducted in 170 facilities by Moazzam *et el* in nineteen districts of KPK & Punjab found that only 75% of District Headquarter (DHQ) hospitals in NWFP, 83% DHQ hospital in Punjab and 67% THQ hospitals provided comprehensive emergency obstetric care services while in 45% ambulances were not available.[12] Basic facilities like electricity, generator, ambulance and sewerage system were available in all the facilities studied in WHO MCS. Similarly, Blood bank was available in 15 of the 16 studied facilities in WHO MCS. In contrast, in 2010, in a study conducted in five districts of Punjab, 8 of the 19 studied facilities had functional blood banks.[6]

The results of our study showed that tertiary level facilities contributed to management of 86% of all women who delivered or were admitted within seven days post abortion or post-partum, while secondary level hospitals managed only 14% of these women. On the contrary, a study conducted in Madhyapardesh, India reveals better utilization of secondary level facilities with 42% women accessing secondary level hospitals during labour.[13]

Absence of required trained staff during evening and night shifts as well as perception of lack of quality services discourages the general population from seeking health care at secondary level facilities.[14,15] This leads to greater number patients with low risk as well as complicated labours and

pregnancies reporting directly to tertiary level hospitals resulting in overburden.[14]

In Pakistan, WHO MC Survey, severe maternal outcome and maternal complications were significantly higher in tertiary level facilities than in secondary level facilities. Four of the secondary facilities studied did not report any severe maternal outcome. Similarly, in the study by Jafarey *et al* in two districts of Pakistan, majority (64 %) of mothers died in tertiary hospitals.[7] In another study done in five districts of Multan, THQ level hospitals did not reveal any maternal death in the preceding year.[6]

Patients are often referred to tertiary levels, sometimes without evaluation and initial management at primary & secondary level facilities.[6] This worsens the severity of patient's illness, thereby further increasing the frequency of women with obstetric complications and severe maternal outcomes in tertiary hospital compared to secondary level hospitals[6,14] as noted in the present study.

The incidence of severe maternal outcomes had a positive correlation with presence of adult ICU, mechanical ventilator and 24/7 availability of anaesthesiologist, nurses and paramedics in our study. Another reason might be that after sustaining primary and secondary delays women reach tertiary level facilities in moribund state [7,14] and it may be too late to save them despite availability of the required services. On arrival in an already overburdened tertiary level hospital, such critical patients may encounter third delay and not get prompt care. This also contributes to higher mortality and morbidity observed in some settings in WHO MCS. Studies done in Pakistan & other developing countries reflect the same trend.[7,16,17]

The study population had a perinatal mortality rate of 17/1000 livebirths which is lower than the nation's neonatal mortality rate of 75 per 1000.[1] but higher than that of developed European countries.[18] As with maternal mortality, the neonatal mortality was found to be higher in tertiary level facilities with availability of neonatal ICU's and incubators. At tertiary level hospitals, where neonatal ICU's and incubators are available, more normal as well as complicated deliveries take place so more babies with complications are born at these hospitals hence resulting in higher perinatal rate in tertiary level facilities.[8] Moreover, occurrence of obstetric complications and maternal deaths directly influence new-borns' health and survival.[3] Tertiary level facilities had greater number of maternal deaths and complications in WHO MCS which further contributed to greater number of perinatal deaths as well.[19]

Strengths: It is a large-scale study exploring the coverage of essential obstetric care in 16 secondary & tertiary government health facilities in Punjab, Sindh & Islamabad.

Limitations:

The WHO Multicountry survey was conducted in secondary & tertiary facilities over a short period. It does not report maternal and neonatal outcomes and coverage of essential interventions in smaller facilities and in the community. Ongoing strike of doctors during this period may have affected the care adversely. The Primary & secondary delays in seeking healthcare are not addressed in the survey. In our study, we did not look into the referral status of patients who received care during the study period.

Patients who might have developed complications or died as a result of sequelae of their complications later than seven days postpartum were not included in the study. Therefore, severe maternal outcomes may have been underestimated.

Recommendations:

Ensuring availability of trained personnel for emergency obstetric care at primary and secondary health facility level through legislation, accountability and incentives. Provision of ICUs in secondary level hospitals to decrease burden in tertiary level facilities and improving referral linkages.

CONCLUSION

Most of the components of Basic EMONC facilities were present in the studied facilities. Adult & neonatal Intensive care services were deficient in secondary level hospitals yet tertiary hospitals with availability of these facilities had more severe maternal outcomes & greater neonatal mortality due to more disease burden.

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AUTHORS' CONTRIBUTION

SBM: Conceptualization of study design, Writeup and proof reading. AB: Data Analysis, Data collection, Data interpretation, Writeup. QA: Data analysis, Literature search, Writeup, Data interpretation.

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