



Utilization of Equipment for Emergency Obstetric Care in the Sub Districts Level Facilities in Bangladesh

**Md. Shafkat Hossain^{1*}, Abu Sayeed Md. Abdullah¹, Abdul Halim¹,
A. K. M. Fazlur Rahman^{1,2}, Md. Jahangir Hossain¹ and Animesh Biswas¹**

¹Centre for Injury Prevention and Research, Bangladesh (CIPRB), Bangladesh.

²Bangladesh University of Health Sciences (BUHS), Dhaka, Bangladesh.

Authors' contributions

This work was carried out in collaboration between all authors. Author MSH designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors ASMA and AH managed the analyses of the study. Authors AKMFR and MJH managed the literature searches. Author AB supervised overall writing of the paper. All authors read and approved the final manuscript.

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ABSTRACT

Background: Comprehensive Emergency Obstetric Care (C-EmOC) equipment were provided to 47 Upazila Health Complexes (UHCs) and Basic Emergency Obstetric Care (B-EmOC) equipment to 192 UHCs in 2003-2004. The tools required for repairing the equipment were also provided to the National Electro-Medical Equipment Maintenance Workshop and Training Centre (NEMEW&TC) in Dhaka and District Electro-Medical Equipment Maintenance Workshops (DEMEW) in 18 districts. Japan International Cooperative Agency (JICA) provided financial support to purchase and distribute of these logistics. This study explored the utilization of EmOC equipment in the sub-district facilities.

*Corresponding author: E-mail: mshossain@hotmail.co.uk;

Methodology: A mix-method, includes both qualitative and quantitative approach, was used to conduct the study during the period of January to June 2014. The study was conducted to understand the status of logistics after 10 years of distribution and utilization in the health facilities. Status of equipment was collected through a self-administrated questionnaire in all facilities (n=213). In-depth information was collected using a structured checklist in randomly selected 26 UHCs and 11 DEMEWs. Research Officers also visited additional 7 UHCs to validate the information received, of which 3 were the highest performing, 2 were lowest performing and 2 UHCs from where authority informed about not receiving any instruments from JICA.

Results: The study explored that 95% instruments were available and 52.9% were currently being used, 17.4% were not being used, 5.9% repairable and 6.4% damaged equipment. Most of the EmOC instruments were found at labour room and in operation theatre at the usable stage. Some instruments were found in the emergency room, storerooms, nursing room, pathology rooms, and doctors' room and in the computer room. In some of the UHCs, almost all the instruments remained intact in the storeroom or operation theatre. In UHC 36.3% of the respondents reported that some of the equipment was not functioning and 51.5% of the respondent knows regarding the Government regulatory policy for maintenance of EmOC equipment. Maternal and neonatal deaths were lower in health facilities with Comprehensive equipment than those of who had received Basic instruments. In DEMEWs 04 respondents among 11 reported that they had required a number of tools for maintenance EmOC instruments.

Conclusion: The study identified a gap between supplies and utilization of essential equipment for emergency obstetric care. It needs to explore further on how best optimum unitization of equipment can be ensured within the available resource.

Keywords: Emergency obstetric care; EmOC instruments; utilization; challenges; Bangladesh.

1. INTRODUCTION

Global motherhood strategy can be ensured by improving the provision of emergency obstetric care especially in developing countries like Bangladesh [1,2]. Globally, 830 maternal deaths occur every day and 99% in developing countries [3]. About 95% of the global maternal deaths occur in 75 low-and-middle-income countries like Bangladesh [4]. The comprehensive emergency obstetric care is recorded, in health bulletin 2016 published by Ministry of Health and Family Welfare, to provide in all tertiary medical college hospitals, district hospitals, maternal and family welfare centers and maximum sub-district health complexes in Bangladesh [5]. Maternal mortality survey in Bangladesh reported that the current maternal mortality ratio (MMR) in 2016 in Bangladesh is 196 wherein 2010 the MMR was 194 [6]. The survey also reported that one in every five mothers doesn't receive any antenatal care (ANC), natal care (NC) and postnatal care (PNC) and 50% mothers don't receive delivery care by skilled birth attendants [6]. These records in some cases may overestimate than actual availability of services particularly due to staffing constraints [7,8]. Facility death review findings in Bangladesh identified the gaps and challenges of availability of equipment and skilled manpower at district and sub-district level public facilities are the barrier to prevent maternal and neonatal deaths [9]. Over the last few decades,

Bangladesh has made an impressive progress in many health indicators including reduction of maternal mortality rate. According to the 2010 Bangladesh maternal mortality and health care survey [2], a major Government of Bangladesh sponsored survey aimed at studying mortality and its determinants has revealed that maternal mortality fell 40% from the levels found in a similar, 2001 survey. This has made a major achievement for Bangladesh and places her ahead of pace to achieve the MDG Goal 5 [10]. A survey in Bangladesh found that the comprehensive EmOC unavailable in public sub-district facilities [11]. All the achievements in maternal health are mainly for Government's strong commitment and focus on reducing maternal mortality through strengthening EmOC services in the health facilities [12]. The Health, Nutrition and Population Sector Program (2003-2010) of the health policy of the Government of Bangladesh (GoB) focused EmOC services as one of the main strategies for reducing maternal mortality while collaboration with UNICEF in expanding medical facilities, the GoB requested assistance from the Government of Japan in 2001 for strengthening EmOC facilities for the UHC throughout the country [13]. Majority of the obstetrical complications can be treated with timely provision of a package of emergency obstetric care [14,15]. Acute maternal morbidity and mortality can be managed by the availability of EmOC [16,17]. The government of Japan

provided the grant aid for Comprehensive EmOC equipment to 47 Upazila Health Complexes (UHCs) and Basic EmOC equipment to 239 UHCs in 2003-2004 in Bangladesh [15]. They also provided the tools for repairing medical equipment to National Electro-Medical Equipment Maintenance Workshop and Training Centre (NEMEW&TC) in Dhaka and District Electro-Medical Equipment Maintenance Workshop (DEMEW) in 18 districts [15]. This study explores the current status of the distributed equipment, problems in utilizing and maintenance of those, to make the decision for necessary follow-up and to recommend adequate measures for optimum use of the instruments.

2. METHODOLOGY

Both qualitative and quantitative methods were used to attain the study objectives. Following specific methods were used to collect necessary information on the status of the EmOC equipment and probable causes of the equipment not functioning as planned.

2.1 Study Area

During the period of 2003-2004 Japan International Cooperation Agency (JICA) provided 6854 EmOC instruments to UHCs in Bangladesh. JICA provided C-EmOC and B-EmOC equipment in 47 UHCs and B-EmOC equipment provided in 192 UHCs. JICA also provided tools for repairing medical instruments at 18 DEMEWs and NEMEW&TC.

To conduct this study the detail information was collected from 26 randomly selected UHCs from the list supplied by JICA. Among these 06 UHCs where C-EmOC equipment was provided and 20 UHCs where B-EmOC equipment was provided were selected randomly. Another seven UHC include 3 high performing, 2 low performing UHCs and 2 UHCs who reported did not receive any EmOC instruments were covered. Moreover, checklists were provided in all UHC where JICA instruments were supplied. Eleven DEMEWs were selected randomly among 18 DEMEWs across the country to collect relevant information. Research Officers collected necessary information from the NEMEW & TC.

2.2 Selection of Facilities

A structured questionnaire and checklist were developed and distributed to all 239 Upazila

Health Complexes (UHCs) for collecting the necessary information on the EmOC equipment status after communicating with Civil Surgeon offices and Upazila Health Complex offices of respective districts and Upazilas. Moreover, Research Officers visited 26 (10%) randomly selected UHCs, 11 DEMEWs and NEMEW&TC to collect detail information through observation of equipment and interviewing relevant stakeholders. Another 7 UHCs were also visited to collect some additional information. Of these 3 were high performing, 2 were low performing and another 2 those who reported about not receiving any EmOC instruments from JICA.

2.3 Data Collection Tools

To collect information of current status of the equipment, Checklist 1 was used where mentioned the name of instruments that supplied in the respective UHC. The objectives of using checklist 1 were to gather information of the number of supplied instruments, availability of instruments, number of existing instruments and functioning status. The structured checklist was followed to assess the current status of the equipment supplied by JICA in randomly selected 26 UHCs. Besides, the same checklist was sent to the rest of 213 UHCs for collected the same information.

To get in-depth status and suggestion on EmOC instruments, a semi-structured questionnaire was developed. The objectives to use this questionnaire were to find out the locations of the equipment, causes of equipment failure, respondents' perception regarding services of DEMEW and suggestions for improving services of DEMEW, GoB's regulatory policy and suggestions for ensuring optimum utilization of the equipment.

2.4 Training on Data Collection

A day-long training was organized to train Research Officers on the procedure of data collection and technical terms and issues related to EmOC equipment. All of the researchers involved in the study of the organization were took part in the training session. Pre-testing of the questionnaires and checklists were done in Monohordi UHC of Narsingdi District. Necessary amendment to the questionnaires and checklists were done after pre-testing to get necessary information and analysis of data. Few suggestions from the facility Manager were incorporated as well.

2.5 Data Collection

One research coordinator and research officers conducted the study. Each Research Officer visited 6 to 7 UHCs and 2 to 3 selected DEMEWs and the NEMEW to collect necessary information. Data collection instruments include checklist for collection of detail information on the current status of the equipment from all the UHCs where JICA supplied the equipment, semi-structured questionnaire for collection of information on the repairing tools contribute to the maintenance work at the DEMEWs and NEMEW&TC, a semi-structure questionnaire for interviewing key informants to collect information on the probable causes of the equipment not functioning as planned and a semi-structured questionnaire for interviewing key informants to collect information on the strength, weaknesses and opportunities regarding the maintenance of equipment at facilities and DEMEW/NEMEW and make recommendations for improving the capacity of facilities and DEMEW/NEMEW for proper maintenance and optimum utilization of the equipment. Respondents for Key Informant Interview (KII) include Assistant Engineer of NEMEW&TC at National Level, Workshop superintendent of DEMEW at District Level and UH&FPO, Senior Staff Nurse (SSN), Store Keeper and Statistician at Upazila Level.

2.6 Data Analysis

A summary plan was prepared to contain dummy tables as per the study objectives. Further, the plan was submitted to the Technical committee or concerned official of JICA for review and approval. The actual tables constructed according to the dummy tables with modifications according to necessity. To avoid inconsistency of data, scrutiny was done after collecting and receiving all information. Professional data entry operators and the statistician developed data entry software and analyzed the data. SPSS version 20 was used to produce different tables to meet the study objectives.

3. RESULTS

The study found that a total number of 6514 instruments (95.0%) were available and of these 3448 instruments were (52.9%) in use and currently not being used instruments were 1131 (17.4%). Consecutively repairable and damaged equipment were 388 (5.9%) and 420 (6.4%). Most of the EmOC instruments which currently

using were found in labour room and in operation theatre. However, few instruments were found in the emergency room, storerooms, nursing room, pathology rooms, and doctors' room and in the computer room. In some of the UHCs, almost all the instruments remained intact in the storeroom or operation theatre.

Out of 33 visited UHCs (randomly selected 26 and additional 7), 36.3% of the respondent reported that some of the equipment was not functioning and another 48.5% reported equipment were not a failure for the mentioned period. Over half (51.5%) of the respondents knew Government regulatory policy for maintenance of EmOC equipment. In 2012 a total number of 20771 ANC, 8611 PNC, 6227 NVD, and 562 CS were conducted in 33 UHCs. Consecutively Neonatal and Maternal Death were 32 and 7 respectively. Maternal and neonatal deaths were lower in health facilities with Comprehensive equipment than those of who had received Basic instruments.

In DEMEWs 04 respondents among 11 reported that they had required the number of tools for maintenance EmOC instruments. Simultaneously 04 respondents mentioned about insufficient skilled manpower. The respondent from NEMEW & TC mentioned that they had neither the required number of tools nor skilled manpower. There were 66 posts for maintenance works but 47 employees are currently working.

3.1 Status of the Equipment in UHC

A total of 6514 instruments (95.0%) were currently available and 3448 instruments were (52.9%) being currently used and currently not being used instruments were 1131 (17.4%). Among the checklist supplied to 213 UHC about 203 UHCs replied their feedback and another 10 UHCs provide feedback as they did not receive any EmOC instruments form JICA.

CIPRB inquired feedback from 213 UHCs and collected information from 26 UHCs. Out of 213, 9 replied about not receiving any instruments from JICA and the rest 204 replied on the following checklist. From 9 non-receiving UHCs, CIPRB randomly selected 2 UHCs and visited physically (Rajoir, Madaripur and Tarail, Kishoregonj). The intense deviation was found between sending information and visit by CIPRB representatives found all the instruments at UHCs. Research Officers revealed that complexity of handling the log book of the store

and not taking help from Senior Staff Nurses (SSN) and ignorance of office staffs while filling up the checklist 1 were the main causes of such misleading feedback.

Survey findings revealed that altogether about 95% of the cases JICA supplied instruments were available at the UHCs. A total of 6,854 instruments were supplied by JICA during 2003-2004 as Japan's grant aid to the Government of Bangladesh as well as maintenance system in the strengthening of Emergency Obstetric Care (EmOC) Services. Of them, 6,514 were reported to be available (95.0%) during the survey. Numbers of currently used instruments were 3448 which was 53% of available instruments. On the other hand, 17.3% instruments were currently not being used. Consecutively repairable and damaged instruments were 6% and 6.4% respectively (Table 1).

In terms of individual instrument, Labour Table, Laryngoscope, Instrument Sterilizer (Electric), Baby weighting Scale, Episiotomy Set, Neonatal Resuscitator/Laryngoscope, Partition (3panels), Uterine Evacuation set, Revolving Stool, Instrument Trolley, Portable weight machine, Height and Weight Scale, Fetal Stethoscope, Stethoscope (5 pcs/unit), Mercury Sphygmomanometer, (Stand Type), Stretcher with trolley, Patient Examination table, Stabilizer, Basin (S/S Bowl), Stand for Basin and Instrument Tray Set etc. are supplied more comparatively other types of instruments. All the supplied pieces of equipment were found either currently using or not using along with some were repairable and damaged. Contrary to this, only anaesthesia machine and instrument sterilizer (Kerosene) were not found damaged.

3.2 Status of Equipment in CEmOC and BEmOC

There are two kinds of EmOC services, Comprehensive Emergency Obstetrics Care (C-EmOC), and Basic Emergency Obstetrics Care (B-EmOC). EmOC instruments need for caesarian section and blood transfusion for complicated pregnancies and B-EmOC instruments are being used for normal deliveries. The number of supplied instruments in the C-EmOC facilities was 2123 and in the B-EmOC facilities were 4731. In terms of currently being used and currently not being used status of C-EmOC and B-EmOC, found data were almost

similar. The percentage of currently using instruments was consecutively 52.1 and 53.3%. Currently not using status of C-EmOC and B-EmOC facilities is 19.1 and 13.4% respectively (Fig. 1).

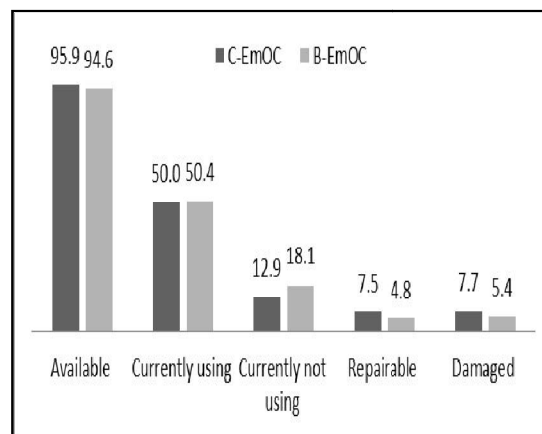


Fig. 1. Status of the equipment by EmOC status

3.3 Findings and Suggestions for Improving the Capacity of Facilities

Checklist two had been used to collect information of the locations of the instruments, name of the failure instruments, perception regarding services of DEMEW/NEMEW, Government regulatory policy and suggestions for maximum utilization of EmOC equipment along with the status of EmOC services provided by the UHCs. Randomly selected 26 UHCs were visited to collect information. Later CIPRB Research Officers visited and collected data from another 7 UHCs. Details information of altogether 33 UHCs is presented in this chapter. In this study, most of the EmOC equipment was found in Operation Theatre (OT), in labour room and some instruments were found in the emergency section, nurses' and storeroom and in the pathology laboratory. That means most of the equipment was installed and maintained in the proper location. However, in some of the UHCs where EmOC services are currently not running and/or absence of EmOC trained personnel for a period of time, instruments were also found intact in the cartoon. Contrary to this, almost all the types of equipment were found currently using. Very few equipment were found damaged for frequent use in many UHCs where EmOC services were available.

Table 1. Status of the equipment of 230 UHCs

Sl. no	Name of equipment/instrument	Supplied number (#)	Available (% & #)	Not available (% & #)	Currently using (% & #)	Currently not using (% & #)	Repairable (% & #)	Damaged (% & #)
1	Anesthesia Machine	45	100.0 (45)	0.0 (0)	66.7 (30)	31.1 (14)	2.2 (1)	0.0 (0)
2	Labour Table	205	97.1 (199)	2.9 (6)	71.4 (142)	12.1 (24)	7.5 (15)	0.9 (18)
3	Laryngoscope	199	96.5 (192)	3.5 (7)	65.6 (126)	30.7 (59)	3.1 (6)	0.5 (1)
4	Operating Table	41	97.6 (40)	2.4 (1)	62.5 (25)	17.5 (7)	10.0 (4)	10.0 (4)
5	OT Light	42	100.0 (42)	0.0 (0)	47.6 (20)	11.9 (5)	28.6 (12)	11.9 (5)
6	Autoclave	45	100.0 (45)	0.0 (0)	40.0 (18)	13.3 (6)	31.1 (14)	15.6 (7)
7	Sterilizing Drum Set	43	100.0 (43)	0.0 (0)	76.7 (33)	14.0 (6)	4.7 (2)	4.7 (2)
8	Instrument Sterilizer, Electric	206	96.6 (199)	3.4 (7)	68.8 (137)	13.6 (27)	10.6 (21)	7.0 (14)
9	Instrument Sterilizer, Kerosene	9	100.0 (9)	0.0 (0)	66.7 (6)	22.2 (2)	11.9 (1)	0.0 (0)
10	Electric Suction Pump Set	44	100.0 (44)	0.0 (0)	63.6 (28)	15.9 (7)	15.9 (7)	4.5 (2)
11	Electric Suction Pump	146	97.9 (143)	2.1 (3)	60.8 (87)	18.2 (26)	16.1 (23)	4.9 (7)
12	Suction Pump (Foot Pedal Type)	9	100.0 (9)	0.0 (0)	55.6 (5)	22.2 (2)	11.1 (1)	11.1 (1)
13	Manual Resuscitator	163	96.3 (157)	3.7 (6)	66.9 (105)	26.1 (41)	2.5 (4)	4.5 (7)
14	Cylinders (with Oxygen therapy Unit)	146	99.3 (145)	0.7 (1)	75.2 (109)	15.9 (23)	4.8 (7)	4.1 (6)
15	Baby weighting Scale	195	95.4 (186)	4.6 (9)	66.1 (123)	15.6 (29)	5.9 (11)	12.4 (23)
16	Neonatal Resuscitator /Laryngoscope	202	96.0 (194)	4.0 (8)	67.0 (130)	26.3 (51)	2.6 (5)	4.1 (8)
17	Uterine Evacuation Set	206	93.7 (193)	6.3 (13)	63.7 (123)	29.0 (56)	3.6 (7)	3.6 (7)
18	Instrument Trolley	194	94.8 (184)	5.2 (10)	76.1 (140)	14.7 (27)	3.3 (6)	6.0 (11)
19	Instrument Tray Set	190	96.3 (183)	3.7 (7)	76.0 (139)	20.2 (37)	1.6 (3)	2.2 (4)
20	Stand for Basin	205	95.6 (196)	4.4 (9)	73.0 (143)	20.4 (40)	2.6 (5)	4.1 (8)
21	Basin (S/S Bowl)	205	96.6 (198)	3.4 (7)	72.7 (144)	24.2 (48)	1.0 (2)	2.0 (4)
22	Centrifuge Machine, Table Top	48	95.8 (46)	4.2 (2)	78.3 (36)	10.9 (5)	8.7 (4)	2.2 (1)
23	Binocular Microscope	27	96.3 (26)	3.7 (1)	65.4 (17)	7.7 (2)	23.1 (6)	3.8 (1)
24	Blood Cell counter	43	86.0 (37)	14.0 (6)	70.3 (26)	18.9 (7)	5.4 (2)	5.4 (2)
25	Examination Light	188	95.7 (180)	4.3 (8)	58.9 (106)	15.0 (27)	13.9 (25)	12.2 (22)
26	Vacuum Extractor	46	95.7 (44)	4.3 (2)	50.0 (22)	20.5 (9)	13.6 (6)	15.9 (7)
27	Stretcher with trolley	199	96.0 (191)	4.0 (8)	65.4 (125)	21.5 (41)	5.8 (11)	7.3 (14)
28	Mercury Sphygmomanometer, (Stand Type)	192	92.7 (178)	7.3 (14)	38.2 (68)	23.0 (41)	15.2 (27)	23.6 (42)
29	Stethoscope, 5pcs/unit	172	95.9 (165)	4.1 (7)	60.0 (99)	17.6 (29)	3.0 (5)	19.4 (32)
30	Fetal Stethoscope	192	93.2 (179)	6.8 (13)	61.5 (110)	27.4 (49)	1.7 (3)	9.5 (17)
31	Air Conditioner	43	100.0 (43)	0.0 (0)	48.8 (21)	14.0 (6)	25.6 (11)	11.6 (5)
32	Generator	31	100.0 (31)	0.0 (0)	54.8 (17)	9.7 (3)	29.0 (9)	6.5 (2)
33	Pulse Oxymeter	41	97.6 (40)	2.4 (1)	40.0 (16)	12.5 (5)	20.0 (8)	27.5 (11)
34	Height and Weight Scale	199	96.0 (191)	4.0 (8)	67.5 (129)	13.6 (26)	12.6 (24)	6.3 (12)
35	Infant warmer	44	95.5 (42)	4.5 (2)	57.1 (24)	19.0 (8)	14.3 (6)	9.5 (4)
Total (number)		4205	4039	166	2629	795	304	311

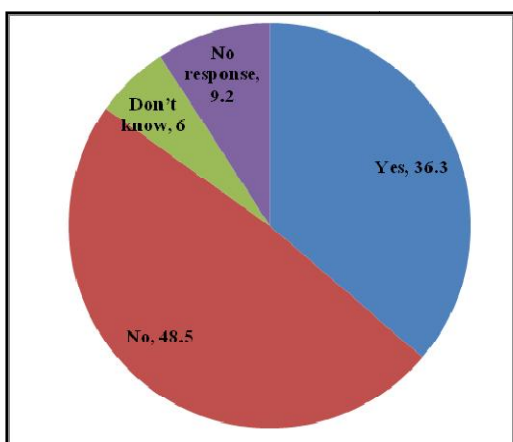


Fig 2. Status of equipment failure in 33 UHCs

Respondents were enquired about the status of the EmOC equipment those were broken down (failure) in the UHC during the last one year (2012). The study found that there were non-functional equipment due to non-utilization of those for a very long period of time. Slightly over one-third of the respondents (36.3%) mentioned that they faced any equipment failure during the last one year; another 49% did not face any equipment failure (Fig. 2).

This study also revealed that in most of the UHCs some of the equipment remained intact in the cartoon and never used at all and simultaneously some of the instruments were damaged because of excessive use. It was found that electric sterilizer, suction pump, autoclave, partition, oxygen unit and stabilizer were on the top of the list of failure equipment. One of the main reasons for EmOC equipment failure is non-utilization of equipment for a long period of time. One if the main reason was identified as the limited Human Resources includes consultants, EmOC trained doctors, anesthesiologists, trained nurses and other staffs.

Most of the UHCs took less service from DEMEWs. As there was no EmOC doctor in most of UHCs, there was no demand for fixing the equipment and that was why 30% of the visited UHCs did not take any services from DEMEWs. Twenty-five percent of the visited UHCs did not have any idea about services of DEMEWs, another 25% of them were happy with the services and rest 20% of them were not satisfied with the services of DEMEWs. The study findings revealed that usually no training workshops on use and maintenance of EmOC

instruments were organized to train personnel from UHCs and in 2012 none of the workshop/training was organized by DEMEWs. Another reason was in most of the cases; UHCs maintained and fixed equipment with the help of local private agencies as they were not willing to receive services from respective DEMEWs. To consume time and to get quick services UHCs preferred local agencies.

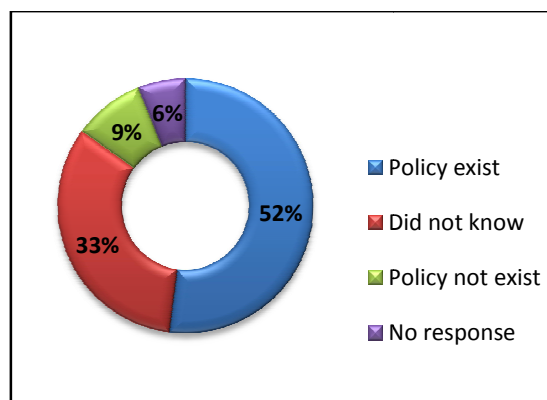


Fig. 3. Status of the government regulatory policy for maintenance of equipment

To get better services from DEMEW and NEMEW, UHCs doctors and other staffs suggested extending more liaison between UHCs and DEMEWs, to establish more DEMEWs for every district and to train both DEMEWs and UHCs personnel on modern EmOC instruments. Half (52%) of the UHCs were concerned about Government regulatory as the respondents were aware regarding such policy on equipment maintenance exists and 9% of respondents mentioned there was no existing Government regulatory policy in this regard. On the other hand, another one third (33%) of the respondents did not know about such policy and Research Officers did not get any response from 2 respondents (Fig. 3).

The research also gathered suggestions from the respondents in terms of optimum utilization of EmOC equipment. All of the respondents suggested that EmOC trained doctors, anesthetics and nurses are essential. Training for staffs of UHCs and DEMEWs on EmOC equipment was also suggested by 70% of the respondents. Apart from these suggestions couple of UHCs' staffs requested JICA and the GoB to query of relevance at UHCs before providing any EmOC instruments.

3.4 Respondents Suggestions for Ensuring Optimum Utilization

Respondents were asked about what are their suggestions for ensuring optimum utilization of the instruments supplied by JICA. In reply 19 respondents mentioned multiple comments such as appoint EmOC trained doctors, anesthetists and nurses in every UHC, 10 respondents mentioned carefully about using the EmOC equipment, 10 respondents emphasized on provide training on new equipment, 2 respondents supposed to maintain proper liaison between DEMEWs and UHCs, supply new and more equipment and spare parts as per need & regular and 1 respondent said to proper monitoring and supervision of the equipment.

3.5 Status and Services of DEMEWs and NEMEW & TC

3.5.1 Status and services of DEMEWs

As part of this study, in-depth interviews had been conducted from 11 DEMEWs. The main objectives of this questionnaire were to find various services of DEMEWs, a number of skilled personnel had in each workshop, a number of workshops/ training organized in 2012 for developing skills of the respective personnel from UHCs as well as to get suggestions from responsible personnel for improving the services of DEMEWs. In terms of sufficient skilled manpower, respondents from Mymensingh, Tangail, Bogra and Barisal had sufficient skilled manpower. Contrary to this, rest of the DEMEW were not satisfied with the number of the skilled manpower they had. It is found that required number of tools and skilled manpower can manage the workload comfortably. Further respondents were asked about the number of trained/skilled manpower in DEMEWs had. On an average, there was about 7 skilled personnel in every visited DEMEW (Highest 9 in Barisal and Lowest 5 in Mymensingh). Respondents were also asked about the number of workshops DEMEWs conducted last year to trained personnel from UHCs. In 2012 none of the DEMEWs organized any workshop to train any personnel from UHCs and thus, in 2012 no one was trained on EmOC equipment maintenance and/or use from any UHCs. There was even no regulatory policy to train up personnel from UHCs. According to the collected data, 440 EmOC equipment was repaired by 7 visited DEMEWs. Another 4 DEMEWs did not do any

maintenance of EmOC equipment due to lack of trained personnel, administrative complexity, shortage of budget and unavailability of spare parts etc.

3.5.2 Status and services of NEMEW&TC

NEMEW provided same types of services, maintenance works and spare parts installation etc.; same as DEMEWs. It was also revealed that NEMEW&TC neither had enough tools nor skilled human resources to provide necessary services to DEMEWs and UHCs. For example, there were 66 posts in NEMEW & TC for maintenance works but 47 employees were currently working. No training workshops had been arranged from NEMEW to train anyone either from DEMEWs or UHCs. NEMEW & TC did not have any exact statistics on the number of EmOC equipment they maintained in last year, as it provided services in its own workshop and personnel of NEMEW & TC visited different DEMEWs sometimes. Usually, in case of technical failure of equipment, UHCs contacts DEMEWs for maintenance. Sometimes personnel from DEMEWs visit UHCs and repair according to conditions of equipment. Besides, sometimes UHCs send equipment to DEMEWs for maintenance. DEMEWs seek help from NEMEW or the related ministry for further assistance. Apart from that, basic equipment was repaired by the local technicians or private agencies and sometimes UHCs staffs ignored minor faults and dumped the types of equipment as those were.

3.5.3 Challenges and way forward

Lack of skilled human resources, proper distribution of budget and long process for importing spare parts were main problems both DEMEWs and NEMEW faced. For example, allocation of the daily allowance for a first class Officer in NEMEW was only 150 BDT and usually, it took more than two months to import after ordering of spare parts. In terms of providing suggestions respondents from 5, DEMEWs mentioned proper distribution and allocation of sufficient budget, supply spare parts, provide transportation facility and organize training and workshops. Three respondents (2 from DEMEWs and 1 from NEMEW) suggested to not ignoring minor faults of the equipment and to organize training on EmOC instruments for the staffs from UHCs. Another two respondents from DEMEWs focused on the careful use of EmOC equipment.

Assistant Engineer of NEMEW & TC suggested –

“It is essential to open an electronics department in NEMEW for maintenance of modern instruments. The periodical or regular maintenance of equipment as well as organizes training for DEMEWs and NEMEW personnel is also important.”

4. DISCUSSION

This study revealed that only 53% of the available instruments were currently in use. All of the respondents explained that due to lack of human resources the types of equipment were not being used. So Ministry of Health and Family Welfare (MoHFW) need to take initiatives for providing adequate trained doctors and other additional staffs at all UHCs. A study in Bangladesh revealed that 81% EmOC readiness was found in private facilities whereas 67% found in the private facilities. Public health facilities had also a low-score of staffing and laboratory capacity. The C-section cost was found 77 US dollar at private facilities whereas free in public health facilities [11].

The research revealed that, among visited 11 DEMEWs, respondents from Mymensingh, Tangail, Bogra and Sylhet mentioned in their DEMEWs had required a number of tools for maintaining all the types of equipment but respondents from rest of the DEMEWs reported they did not have required number of tools. Some DEMEWs did not have much workload because UHCs did not send basic equipment for repair minor faults on regular basis. Proper distribution and allocation of sufficient budget, unavailability of spare parts and scarcity of transportation for DEMEWs staffs were the main constraints of maintaining equipment, even though UHCs send equipment for maintenance to DEMEWs. Another study also supported our findings [7,8,18].

The research found that DEMEWs provided all kinds of maintenance works, including replacing of spare parts and repairing of EmOC instruments. Installation of equipment is also major parts of their services, the respondents mentioned. Distribution of budget for repairing/maintaining also described in our study. There should be a specific budget for UHCs to maintain all EmOC equipment and to buy or import spare parts. It is also essential to allocate budget for organizing training on maintenance and usage of EmOC instruments. A study in

Bangladesh revealed that low annual allocation to health in government budget and inadequate access to health services between urban and rural areas with variable health financing mechanism are the major challenges in achieving the universal health coverage which is supported by another study [19,20].

The study revealed that, among the visited UHCs, the highest number of 21 UHCs installed and/or put instruments at OT and in-store room along with some other places. In each of the 11 UHCs, the majority of the instruments were found in labour and storeroom. On the other hand, in some UHCs majority of the instruments found in the emergency room, pathological laboratory, and nurses' room as well. The similarity found in another study in Bangladesh [19].

Our study described the strengthening maintenance system. Along with the budget, proper maintenance system for the instruments is also required. At the same time, strengthening preventive and periodic maintenance is also very important. Implementation and awareness of Government regulatory policy in the maintenance of equipment would be the key to strengthening maintenance system. More liaisons between UHCs and DEMEWs could make the maintenance activities easier and successful. Keeping the record and maintaining log books properly and accurately is also one the major parts of documentation for smooth handling of equipment which is similar to another study [19,21].

DEMEW supposed to play a key role in the maintenance of equipment but administrative complication, distribution of budget and untrained human resources are the main constraints to do so. Segment budget for DEMEWs and NEMEW would be helpful to allocate travelling and daily allowance, to buy spare parts and to arrange training for NEMEW, DEMEWs and UHC staffs. There are 18 DEMEWs for about four decades but the numbers of the district are 64. Separate DEMEW for every district would make maintenance process easier both for DEMEWs and UHCs. In-service training and electronics department is also recommended for strengthening the capacity of NEMEW. The similarity found in some WHO reports [22,23].

Donors and Government of Bangladesh should examine the relevance of the health facility before supply the EmOC instruments. There should be five years contract for maintenance

and supply of spare parts among suppliers, donors and Government of Bangladesh. Donors/development agencies and/or Government of Bangladesh should conduct follow-up survey periodically to get the current status. There were some deviations between feedbacks; those were sent by UHCs, and the result of the physical visit. As out of 239 UHCs, only 33 UHCs were physically visited. It is recommended that such kind of follow-up survey would provide exact scenario if all data could be collected physically from every UHCs. Another study in Bangladesh revealed the similar finding [24,25].

5. CONCLUSION

About 95% instruments were available and 53% of them were currently using and 17.4% were not currently using. There are gaps and challenges in human resources, Government health policy, monitoring and maintaining and utilization of that equipment. Lack of trained doctors and skilled manpower in the sub-district facilities (UHC) are the main reasons for not currently using the equipment. There were gaps in policy making, monitoring and maintenance of the equipment. Lack of distribution of budget, administrative complications and insufficient tools and human resources triggered the maintenance problem deeper. It needs to overcome these challenges to ensure EmOC services which certainly affect positively in the maternal health sector.

CONSENT AND ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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