Quality Improvement System for Maternal and Newborn Health Care Services at District and Sub-district Hospitals in Bangladesh
Dedication

To the mothers and the newborns of the globe who deserve a quality life
Quality Improvement System for Maternal and Newborn Health Care Services at District and Sub-district Hospitals in Bangladesh
Abstract
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In Bangladesh, research focusing on the quality of maternal and newborn health (MNH) services in hospitals remains neglected. There have only been a few studies conducted on quality issues and found the quality of MNH care provided at district and sub-district hospitals to be poor. The overall objective of this thesis was to develop, implement and evaluate a framework for quality improvement (QI) system for MNH care at the district and sub-district level government hospitals in Bangladesh. The thesis is comprised of four papers. Mixed methods were used in paper I and paper IV. In paper II quantitative methods were utilized, and to develop the “Model QI System”, exploratory methodological approaches were used and illustrated in paper III. Group discussions, focus group discussions, in-depth interviews, documents review and photography were utilised as qualitative data collection techniques. Through structured observation and exit interviews quantitative data were obtained. Findings of baseline survey identified several key factors that affected the quality of patient care: shortage of staff and logistics; lack of laboratory support; under use of patient-management protocols; lack of training; and insufficient supervision. The clinical performance of health care providers was found unsatisfactory. Utilizing the baseline survey findings and existing information on QI models, theories and QI intervention programmes implemented in different settings an adapted “Model QI System” and its implementation framework, guidelines and tools were developed. The key areas of this “Model QI System” included health system support, clinical service delivery, inter-departmental coordination; and utilization of services and client satisfaction. The adopted “Model QI System” was incorporated within the existing hospital management system and it was found that the quality of care improved. The evaluation of the study showed that the “Model QI System” was acceptable to the top health managers, health care providers and hospital support staff and feasible to implement in district and sub-district hospitals in Bangladesh.

Keywords: Bangladesh, hospital, maternal health, newborn health, quality improvement.

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List of publications


III. Islam F, Rahman A, Halim A, Eriksson C, Rahman F and Dalal K. A model quality improvement system for maternal and newborn health services applicable for district and sub-district level government hospitals, Bangladesh: description of model development process (Submitted)


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Definitions

**Quality health care:** Avedis Donabedian, the pioneer and the leading thinker of modern quality improvement defined quality medical care as “that kind of care which is expected to maximize an inclusive of patient welfare, after one has taken account of the balance of expected gains and losses that attend the process of care in all its parts” (1).

US Agency for Health Care Research and Quality defined quality health care as “Doing the right thing, at the right time, in the right way, for the right person and having the best possible results” (2).

**Tertiary level hospitals:** Tertiary level hospitals are defined as “Specialized hospitals, institutes and medical college hospitals equipped with specialized manpower and modern equipment to provide specialized care and treatment of referred cases from the district hospitals and health facilities throughout the country and situated in regional level”. Super-speciality hospitals of national level are also considered as Tertiary level hospitals (3).

**Secondary level hospitals**

*District Hospitals* are defined as “the secondary level hospitals where advanced care and specialist services in medicine, surgery, obstetrics and gynaecology, paediatrics, ophthalmology, clinical pathology, blood transfusion and public health services are provided but those are comparatively less than a medical college hospitals with 50 to 200 beds”. District hospitals are under Directorate General of Health Services, Ministry of Health and Family Welfare, Government of the People’s Republic of Bangladesh (3, 4).

*Maternal and Child Welfare Centres (MCWCs)* are also secondary level hospital but these hospitals only provide Emergency Obstetric Care (EmOC) which comprise of 20 beds. The MCWCs are under Directorate General of Family Planning, Ministry of Health and Family Welfare, Government of the People’s Republic of Bangladesh. Both the secondary level hospitals are the referral point of sub-district and below level health facilities (3, 4).
Primary level health facilities

*Upazila Health Complexes (UHC)* are considered as primary health care centres and the first referral point with bed capacity of between 31 and 50 (4).

Union Health and Family Welfare Centres and Community Clinics in union level and below also provide primary healthcare, however, these centres do not have any in-patient departments (4).
## List of abbreviations

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tbody>
<tr>
<td>BNC</td>
<td>Bangladesh Nursing Council</td>
</tr>
<tr>
<td>CIPRB</td>
<td>Centre for Injury Prevention and Research, Bangladesh</td>
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<tr>
<td>DGFP</td>
<td>Directorate General of Family Planning</td>
</tr>
<tr>
<td>DGHS</td>
<td>Directorate General of Health Services</td>
</tr>
<tr>
<td>DNS</td>
<td>Directorate of Nursing Services</td>
</tr>
<tr>
<td>FADE</td>
<td>Focus-Analyze-Develop-Execution-Evaluation</td>
</tr>
<tr>
<td>5S</td>
<td>Sort-Set-Shine-Standardize-Sustain</td>
</tr>
<tr>
<td>GoB</td>
<td>Government of Bangladesh</td>
</tr>
<tr>
<td>HBB</td>
<td>Helping Babies Breathe</td>
</tr>
<tr>
<td>HCPs</td>
<td>Health Care Providers</td>
</tr>
<tr>
<td>HICs</td>
<td>High-income Countries</td>
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<tr>
<td>HNPS</td>
<td>Health, Nutrition and Population Sector Program</td>
</tr>
<tr>
<td>JICA</td>
<td>Japan International Cooperation Agency</td>
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<tr>
<td>KAIZEN</td>
<td>(Japanese word) Continuous Quality Improvement in English</td>
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<tr>
<td>LMICs</td>
<td>Low and Middle-income Countries</td>
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<tr>
<td>MCH</td>
<td>Maternal and Child Health</td>
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<td>MCWC</td>
<td>Maternal and Child Welfare Centre</td>
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<tr>
<td>MDGs</td>
<td>Millennium Development Goals</td>
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<tr>
<td>MiH</td>
<td>Making It Happen</td>
</tr>
<tr>
<td>MMR</td>
<td>Maternal Mortality Ratio</td>
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<tr>
<td>MNH</td>
<td>Maternal and Newborn Health</td>
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<tr>
<td>MOHFW</td>
<td>Ministry of Health and Family Welfare</td>
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<tr>
<td>MPDR</td>
<td>Maternal and Perinatal Death Review</td>
</tr>
<tr>
<td>NGO</td>
<td>Non Government Organization</td>
</tr>
<tr>
<td>PDCA</td>
<td>Plan-Do-Check-Act</td>
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<tr>
<td>QI</td>
<td>Quality Improvement</td>
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<tr>
<td>TQM</td>
<td>Total Quality Management</td>
</tr>
<tr>
<td>UHC</td>
<td>Upazila Health Complex</td>
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<tr>
<td>UN</td>
<td>United Nations</td>
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<tr>
<td>UNFPA</td>
<td>United Nations Population Fund</td>
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<tr>
<td>UNICEF</td>
<td>United Nations Children's Fund</td>
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<tr>
<td>WHO</td>
<td>World Health Organization</td>
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1 Introduction

World Health Organization stated that the residents of low and middle-income countries (LMICs) do not receive adequate quality health services compared to high-income countries (HICs). The main challenges for LMICs to provide quality health services to the people are political instability, social stigma, resource constrains including human resource and logistics, inadequate structures, lack of access to comprehensive health care services and inequity in terms of geographical, economical and sociocultural (5).

In LMICs, including Bangladesh, healthcare system suffers from various inadequacies related to staff training, prenatal screening, knowledge and use of evidence-based protocols on providing clinical care, prompt cesarean delivery, multidisciplinary care for mother and newborn, and lack of quality improvement (QI) support. A weak healthcare system of these countries places women and their newborns at risk for morbidity and mortality. Poor quality care during hospital births is a major contributing factor to maternal and newborn related complications and deaths in developing countries (6-9).

Being a country with high under-five mortality rate (U5MR), Bangladesh is one of the 13 countries where notable reduction of under-5 mortality occurred and achieved the target of Millennium Development Goal 4 (MDG-4) (5). The under-five mortality rate reduced from 144 to 38 between 1990 and 2015. However, 24 deaths per 1,000 live births occurs during the newborn period which is still high and it is almost two thirds (62%) of all under-5 child deaths of Bangladesh (10). Bangladesh is on track of achieving MDG-5 target and the maternal mortality ratio declined from 322 to 170 per 100,000 live births between 2001 and 2013 (11-14). However, among the ten countries responsible for 59% of global maternal mortality Bangladesh ranked ten (15).

Bangladesh has remarkable achievement towards Millennium Development Goal 4 and 5. However, the recent Sustainable Development Goal-3 (SDG-3) set a new target to reduce maternal deaths less than 70 in 100,000 live births and under-5 and newborn deaths less than 25 and 12
per 1,000 live births respectively; and achieving global health coverage through access to quality basic health care services by 2030 which is challenging for Bangladesh (16).

For the last several years, both the developed and developing countries identified quality of health care services as an emerging concern to ensure healthy lives (17-19). Globally health policy planners, health care providers (HCPs) and public health researchers recognized the need to provide quality health care through effective quality improvement (QI) interventions. Different countries for different health settings developed and implemented QI intervention programmes considering evidence-based practices. The evidence-based QI intervention programme is found to be effective in one health care setting but cannot always be transferable for other settings as the QI programme success usually depends on the health system, availability of resources including human resource, capacity of the hospitals and patient load as well as the socio-economic and cultural context of the country.

Bangladesh is one of the developing countries where research on quality of MNH services of hospitals remains almost neglected. Very few studies were conducted on quality issues and revealed that the quality of MNH services provided to the patients is poor (20-22). The evaluation report of the Health Nutrition and Population Sector Programme (HNPSP) by the government of Bangladesh complemented these study findings and recommended to address the gap in the field of quality health services delivery of hospitals especially MNH related care (23). However, hospitals of Bangladesh have little experience with quality improvement methods and the documents on such programmes are scarce (24). Moreover, no study was conducted to develop and evaluate an evidence-based QI intervention programme to address the gap of knowledge on providing quality MNH services in district and below level hospitals in Bangladesh. These two levels of hospitals are central to overall institutional services for women and newborns in Bangladesh. Therefore, it is crucial to develop and evaluate a QI model system and its implementation framework considering the country context to improve the knowledge on quality of MNH care at district and below level hospitals of Bangladesh.
2 Background

At the end of the 20th century, quality improvement (QI) becomes one of the most important issues considered by the health policy planners, health care providers and public health researchers globally. In 2015, the estimated global maternal, under-5 children and newborn deaths were 303,000, 5.9 million and 2.7 million respectively; however, the majority of these deaths are preventable through providing quality care in hospitals (10, 15, 25). Quality care is always a challenging issue, especially in LMICs. There is a debate about the definition of quality health care and there is no unique process of measuring the quality, which could be suitable for every country. Therefore, it is essential to select the definition of quality health care and its measurement process considering the health system and socio-cultural and economic status of the country.

2.1 QI-Concepts and definitions

Since two decades quality improvement of health care has been found to be one of major issues discussed among the global health policy experts, public health re-searchers and health care providers (26-27). The concept of quality health care is both ancient and multidimensional. Hippocrates, the father of medicine, and Moses Maimonides, a philosopher and physician, in their medical oath portrayed the concepts of quality of health care in 5th century BC and in 12th century AD respectively (28-29). Both developed oaths to protect the rights of the patients. In other words, according to the oaths a patient should not be harmed by any means and the knowledge and practice related to medical care should be better from the previous to the present days. The origin of the modern ideas and theories of quality care are based on the oaths of Hippocrates and Maimonides.

A new era of quality of health care started in 1966, when Avedis Donabedian, the pioneer and the leading thinker of modern era of quality improvement, described the new concept of quality care. He defined quality of health care as “that kind of care which is expected to maximize an inclusive of patient welfare, after one has taken account of the balance of expected gains and losses that attend the process of care in all its parts” (1).
In the field of quality health care, “Donabedian Quality Triad” is itself an innovative effort to understand how to measure the quality improvement in healthcare. Structure, process and outcome are the three components of this triad, which always uphold a linear relationship (30-32). In our case, hospital infrastructures including health care providers and their education, existing hygiene routines, logistics, supplies and equipment are the main apparatus of providing services to the patients and are evaluated through structure measurement. Adequate capacity of the hospital settings and competence of the health care providers are the key requirement to provide quality care to the patients. The process measurement examines whether the offered health services are timely, effective, safe and evidence-based. To describe the structure and process measurement Donabedian emphasised on appropriateness and comprehensiveness of information collected during history taking, patient examination, diagnostic tests and treatments. He also emphasised the rationalisation of test and treatments, preventive caution for further illness and continuity of health services along with the acceptance of the services by the patients. This mechanism is recognized as evidence-based clinical practice. As per the quality triad, endpoint of the measurement of quality is assessing outcome. It is often illustrated by mortality, length of hospital stay, infection, hospitalization and functional recovery of the patients during discharge.

Although, Donabedian placed structure as a precondition for process and outcome measurements, however, all three components of quality measurement stand in isolation as well and could be measured in any point which was also explained in a review article written by Luce et al (33).

Donabedian in his revolutionary quality measurement framework did not consider patient safety, health care cost and effectiveness of health services. In 2001, Institute of Medicine (IOM) presented its report titled “Crossing the Quality Chasm” and a new framework for improving quality of care and its evaluation addressing those issues. The IOM defines quality as “Degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge”. The report stated that the quality care should be safe, effective, patient centred, timely, efficient and equitable (34-35). Considering the IOM quality concept, in 2005, US Agency for Health Care Research and Quality defined quality health care as “Doing the right thing, at the right time, in the right way, for the right person- and
having the best possible results”, which is currently used by public health researchers (2).

2.2 QI models and approaches
Considering the settings of LMICs and HICs, different types of QI models and approaches are employed to improve the quality of hospitals care. In health care the following models and approaches are commonly used.

2.2.1 FADE QI model
FADE is a problem solving quality improvement model developed by Organizational Dynamics, a private organisation of USA (36-38). The FADE model consists of four phases namely focus, analyse, develop, and execute and evaluate (Figure 1).

![FADE Model](image)

**Figure 1:** FADE Model: a four phase cycle

This model is utilised to find out the problem area and assess the magnitude of the problem, develop a process of minimizing this problem. Then the process is executed and evaluated to improve the situation.
**Phases of FADE model**

**Focus** – According to the FADE model to improve the quality of health care the prime job is to prioritise the area of improvement and focus on it. Focus on multiple issues may affect the appropriateness of the intervention programme and its successful implementation.

**Analyse** – An in-depth analysis of the problem needs to be done to explore the hindering issues behind the scene, which are the barrier to provide quality care.

**Develop** – In this phase the base line findings are utilised to develop appropriate action plan along with its implementation framework as solution of the identified problems.

**Execute and evaluate** – Implementation, monitoring and evaluation of the action plan are the components of this phase.

### 2.2.2 PDCA Cycle

PDCA (plan-do-check-act) is a four-step problem solving cycle developed by Walter Shewhart in 1930 (39). Edwards Deming adopted this cycle and described its theoretical approach in a lecture on quality control methods delivered in front of Japanese scientists and engineers in 1950. PDCA cycle is also known as “Deming cycle” (40).

![PDCA cycle](image-url)

*Figure 2: PDCA cycle*
The concept of PDCA cycle has become popular in the field of quality health care as it is simple and powerful and follows the process of “hypothesis”, “experiment” and “evaluation” (Figure 2). Deming designed the cycle which could be employed as a dynamic model and after completion of each cycle, a new cycle would be started as a part of continuous quality improvement (CQI). According to this cycle QI process can analyse and re-analyse in any point of the cycle and new direction in terms of quality improvement can be incorporated for innovative and novel changes (41-42).

Steps of PDCA cycle
Plan – The plan starts with the identification of the problems, which play vital role as a barrier to provide quality services and opportunities for quality improvement. Through this step the areas of quality improvement is prioritised. An action plan is developed which includes the areas of improvement, what to achieve, when and which methods would be employed to achieve the target.

Do – All the activities of the action plan is implemented here.

Check – The activities of the action plan are supervised and monitored in check step and the deviation from the action plan, if any, is identified here. Validity of the action plan towards the positive changes or failure of the set objective is tested through outcome observation.

Act – The PDCA cycle ends in this step through integrating the lesson learnt from the entire course of action. Adoption of the changes towards the improvement occurs here. The team can adjust the methods and reformulate it and repeat it in “Do” step. Return to the “Plan” step is initiated here again if the changes do not meet the goal. Considering the lessons learnt a new action plan is developed and thus the PDCA cycle repeats as a part of continuous quality improvement process.

2.2.3 5S-Kaizen-TQM approach
Initially 5S-KAIZEN-TQM approach was utilised in the Japanese industrial sector (43). The same approach was adopted for stepwise improvement of hospital services and employed in a Japanese maternity hospital, as well as in other countries(43-44). It follows the bottom up approach and uses the principles of 5S (Sort-Set-Shine-Standardize-Sustain) and partici-
patory KAIZEN (Continuous Quality Improvement: CQI) process to feed and monitor inputs towards quality improvement (Figure 3). The whole process would follow an evidence based participatory problem-solving mechanism leading to the final stage of total quality management (TQM) under stewardship and guidance of the top management level.

<table>
<thead>
<tr>
<th>5S</th>
<th>KAIZEN (CQI)</th>
<th>TQM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sort Set</td>
<td>2. Problem solving approach</td>
<td>3. Monitoring progress using qualitative indicators</td>
</tr>
<tr>
<td>Shine Standardize Sustain</td>
<td></td>
<td>Top Management Leadership Coordination Supportive</td>
</tr>
<tr>
<td>1. PDCA Plan → Do → Check → Act</td>
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</table>

**Figure 3: 5S-Kaizen-TQM for Quality Management**

Initially the assigned team in each work area follows 5S especially sort-set-shine steps in improving work environment which would be the basic for improving positive mind set, confidence and performance by providers as well as client satisfaction: the important component of quality of care. KAIZEN is an improvement of work process and contents of services, through participatory problem solving approach. The KAIZEN adopted PDCA cycle and problem-solving approaches for Planning, then Doing followed by a Check to Act – a participatory process for continued quality improvement in specific work area and then in the whole system. Total Quality Management (TQM) is a management approach that aims for long-term success based on the involvement of all levels of the organisation, starting with full commitment at the top.

**2.3 QI interventions from LMICs and HICs: a literature review**

The objective of the literature review was to find out the gaps: what is known and what needs to know about existing effective “QI” intervention programmes to improve the quality of care of hospitals in developed and developing countries.

In order to obtain the articles PubMed and Google Scholars were utilised as search engine. During computer search to identify the potentially eli-
ble articles, we emphasised on year of publication, population, type of interventions, outcome measures and language.

The following criteria were used to make the search appropriate for the review:

- **Journal type**: Peer-reviewed journals
- **Date of publication**: October 1, 2005 - September 30, 2015
- **Publication language**: English
- **Type of studies**: Intervention study with quantitative and/or qualitative research;
- **Data types**: Primary data only
- **Articles addressed**: Programme on quality improvement
- **Study settings**: Hospitals
- **Health outcomes of interest**: Primary outcomes-improvement of hospital care services.

To meet the objectives of the literature review different combinations of key words were used for finding the relevant articles.

**PubMed search engine**

Utilizing the MeSH Terms “Quality improvement” and “Hospitals”, “Maternal welfare”, “Infant, newborn” “Health”, “Developing countries” and “Developed countries” and “Intervention” in PubMed we found 9671 articles. During PubMed advanced search, we also used key words namely “PDCA model”, “5s KAIZEN approach” and “TQM model” and added 333 more articles. The summary of the search in PubMed was written over leaf (table 1).
Table 1: Summary of literature review from PubMed

<table>
<thead>
<tr>
<th>Search terms</th>
<th>Articles found</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1 Search (Quality improvement) AND Hospitals</td>
<td>9160</td>
</tr>
<tr>
<td>#2 Search (((Quality improvement) AND Hospitals)) AND Maternal health</td>
<td>179</td>
</tr>
<tr>
<td>#3 Search (((Quality improvement) AND Hospitals)) AND Newborn health</td>
<td>265</td>
</tr>
<tr>
<td>#4 Search (((((Quality improvement) AND Hospitals)) AND ((Quality improvement) AND Hospitals)) AND Maternal health)) AND (((Quality improvement) AND Hospitals)) AND Newborn health)) AND Developing country</td>
<td>9</td>
</tr>
<tr>
<td>#5 Search (((((Quality improvement) AND Hospitals)) AND Maternal health)) AND (((Quality improvement) AND Hospitals)) AND Newborn health)) AND Developed country</td>
<td>5</td>
</tr>
<tr>
<td>#6 Search ((PDCA model) AND Quality improvement model) AND Hospital</td>
<td>15</td>
</tr>
<tr>
<td>#7 Search (TQM model) AND Hospital</td>
<td>38</td>
</tr>
</tbody>
</table>

Initial screening for find-out the eligible article were done through the inclusion criteria for search limitation and found 1000 articles. Based on the judgment on title 259 articles were selected to read abstracts. Finally 82 articles were found eligible to read. Subsequently all relevant articles were reviewed in terms of its objectives, methodology and results and 8 were selected for analysis.

**Google Scholar search engine**

We utilised Google Scholar search engine to review the articles and the inclusion criteria for search remained the same as used during PubMed Search. We used the key words namely “5s TQM KAIZEN model”, “PDCA cycle”, “and Hospital” and “Quality improvement”. Total 957 articles were shown with search limitation, among those 60 articles were selected for abstract reading. However, 39 articles of the total were found eligible for read. Finally, based on objectives, methodology and results 2 articles were selected for analysis.

**Orebro university library data base and HINARI**

Orebro university library data base and HINARI were accessed to get the full articles which were not available in PubMed and Google Scholar search engine.
We followed three steps strategy during literature search with a linear relationship. These were title, abstract and article. Based on the objective of our literature review, we first selected the titles of the articles. All the titles were read carefully and tried to find out abstracts which might be related to the studies where quality improvement intervention program were the subject of interest. After reading all the abstracts, several articles were selected for reading full text. Finally 10 articles were selected for analysis which met all the criteria of our literature review.

Defining the quality of care, and how to measure its improvement for a particular health context is remained difficult as it depends on the socio-cultural and economic status; and on the health system of the countries. Keeping it in mind we selected 10 articles with quality improvement intervention study from both the developing and developed countries including Asia, Africa, Europe and America.

**Analysis of the articles reviewed**

Through a comprehensive literature review followed by a reproducible stepwise process we selected ten articles related to intervention programs for quality improvement of health services of the hospitals. A narrative analysis process was utilised to scrutinize the articles. Qualitative research technique namely thematic analysis was adopted to generate the common themes for these review articles. The next stage of the analysis was to segregate the major themes in sub-themes. To address the objective the themes and sub-themes were re-checked and after removing the unrelated content the themes and sub-themes were finalized as result. Four major themes namely 1) health system support; 2) clinical service delivery; 3) inter-departmental/agency coordination; and 4) supervision and monitoring that impacted quality of health care services of hospitals were identified.

**Results of the article reviewed**

Based on the major four themes the result section is designed. The selected study with their outcomes has been illustrated in table 2.

1. **Health system support**

   **Infrastructure:** One of the objectives of the Johns Hopkins Hospital, study to identify the local causes which might be the barriers to implement quality improvement (QI) program (45). They found that infrastructural prob-
lem like patients’ rooms were very close to one another and too much sound pollution due to room alarm and sea sounds; and lights of the rooms were very strong which impacted on patients’ sleep. To improve the quality of sleep the Johns Hopkins Hospital study adopted a very simple intervention by reducing the alarm sounds, initiating soothing music through TV channel and diminishing the lights. The QI teams proved that this type of intervention was feasible. Study conducted in Tanzania and Malawi revealed that low standard of infrastructure and lacks of preparedness of the settings were the factors which were the barriers to provide quality health services (46, 49).

**Human resources:** Children’s Hospital, North Bronx, New York study showed that waiting time of the patients was decreased by increasing number of healthcare providers. Ethiopia study also revealed that lack of human resources and its rational utilization played an important role on quality of care (48). Similar findings were revealed in Malawi study. In this study it was found that high rate of turnover of the health care providers was one the causes of poor quality of services (49).

**Logistics and equipments:** Study conducted in Cincinnati Children’s Hospital Medical Centre, USA showed that unavailability of drugs, defective and lack of equipments were the barriers to provide quality airway clearance therapy (17). Similar types of findings were found in Tanzania and Malawi study (46, 49).

2. **Clinical service delivery**
Most of the study revealed that quality of clinical care services depended on the knowledge and skill of the health care providers (17-18, 45-47, 49-50). We found that training on helping baby’s breath conducted in Tanzania study appreciably improved the score of quality of observed essential newborn care (46). Hand hygiene promotion program improved the knowledge and compliance of hand washing of the health care providers (47). The same types of training and education programs including counselling were utilised in other studies selected for this analysis (17-19, 45, 49-50). Behavioural program for patients also introduced to improve the clinical service delivery in Cincinnati study (17).
3. **Inter-departmental/agency coordination**
Tanzania study showed that government and international donor organization coordinated QI initiative program had better impact to achieve Millennium Development Goal target of maternal and newborn health (46). Study in Johns Hopkins Hospital showed improvement the relationships between department through engagement of all types of stakeholders and providers brought positive result on quality care (45).

4. **Supervision and monitoring**
Monitoring system to improve the hand hygiene compliances was adopted as a component of QI intervention program in Hallym University (47). Majority of the studies formed quality improvement teams with the managers of the hospitals, as well as the health care providers including doctors, nurses and staff to monitor and supervise the intervention program which showed a positive impact on quality improvement.

The reviewed QI intervention programme implemented in LMICs and HICs and outcomes is given over-leaf (Table 2)
Table 2: Reviewed QI intervention programme implemented in LMICs and HICs and outcomes

<table>
<thead>
<tr>
<th>Authors, year, title and country of study</th>
<th>Type of study and settings</th>
<th>Strategy of the study</th>
<th>Outcome/findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kamdar et al. 2014 (45). “Developing, Implementing, and Evaluating a Multifaceted Quality Improvement Intervention to Promote Sleep in an ICU”. USA.</td>
<td>Intervention study. Johns Hopkins Hospital Medical ICU.</td>
<td>To evaluate the feasibility of an established QI model to improve the sleep quality.</td>
<td>Already established multifaceted QI model could be implemented in ICUs of hospitals to promote sleep.</td>
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<tr>
<td>Makene et al. 2014 (46). “Improvements in newborn care and newborn resuscitation following a quality improvement programme at scale: results from a before and after study”. Tanzania.</td>
<td>Intervention (pre-post) study. 52 health facilities of Kenya including lower level health facilities and regional hospitals.</td>
<td>Assess the quality of essential newborn care to evaluate the improvements in basic emergency obstetric and newborn care (BEmONC) after QI programme. Components of programme: - training for health care providers (nurses, midwives, clinical officers, and assistant medical officers) in BEmONC and routine delivery care, - provision of essential equipment (e.g., bag-and-mask device, suction), supportive supervision of BEmONC.</td>
<td>- Quality of newborn care, including skin-to-skin care, delayed cord clamping, breastfeeding within one hour of birth and the overall index score for quality of newborn care improved significantly - Knowledge on newborn resuscitation increased - Skill on newborn resuscitation dropped.</td>
</tr>
<tr>
<td>Authors</td>
<td>Year</td>
<td>Title</td>
<td>Location</td>
</tr>
<tr>
<td>------------------</td>
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<tr>
<td>Lee et al.</td>
<td>2014</td>
<td>“Improved hand hygiene compliance is associated with the Change of perception toward hand hygiene among medical personnel”.</td>
<td>South Korea.</td>
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<tr>
<td>Heptulla et al.</td>
<td>2013</td>
<td>“A quality improvement intervention to increase access to pediatric subspecialty practice”.</td>
<td>North Bronx, New York.</td>
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<tr>
<td>Rawlins et al.</td>
<td>2012</td>
<td>“Reproductive health services in Malawi: An evaluation of a quality improvement intervention”.</td>
<td>Malawi.</td>
</tr>
<tr>
<td>Authors</td>
<td>Year</td>
<td>Title</td>
<td>Location, Countries</td>
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<tr>
<td>Flather et al.</td>
<td>2011</td>
<td>“Cluster-randomized trial to evaluate the effects of a quality</td>
<td>France, Italy, Poland, Spain, UK.</td>
</tr>
<tr>
<td>Ernst et al.</td>
<td>2010</td>
<td>“Using Quality Improvement Science to Implement a Multidisciplinary Behavioral Intervention Targeting Pediatric Inpatient Airway Clearance”</td>
<td>USA.</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Study Type</td>
<td>Country</td>
<td>Overview</td>
</tr>
<tr>
<td>------------------------</td>
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<td>Bradley et al. 2008 (51)</td>
<td>Intervention (pre-post) study.</td>
<td>Ethiopia.</td>
<td>Hospital quality improvement in Ethiopia: a partnership-mentoring model.</td>
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<tr>
<td>Filardo et al. 2008 (19)</td>
<td>Hospital-randomized controlled trial.</td>
<td>USA.</td>
<td>Challenges in Conducting a Hospital-Randomized Trial of an Educational Quality Improvement Intervention in Rural and Small Community Hospitals.</td>
</tr>
</tbody>
</table>
2.4 Maternal, child and newborn health situation

In Millennium Summit, held on September 2000 at New York, 189 countries agreed to “Millennium Declaration” and in 2001 the United Nations Secretariat published “Millennium Development Goals (MDGs)” which included 8 goals with 17 indicators. The general objective of the MDGs was to decrease poverty and human deprivation. Among the eight goals the 4th and 5th addressed maternal and child health (52).

Reduction of under-5 mortality rate by two-thirds and maternal mortality ratio by three quarters between 1990 and 2015 were the MDG-4 and MDG-5 respectively (5). Remarkable progress in reduction of both types of deaths has been made. The under-5 deaths reduced from 12.7 million to 6.0 million between 1990 and 2015, which is considered as 50% reduction of under-5 mortality rate globally. The newborn deaths also reduced from 5.1 million to 2.7 million during the same period. However, the newborn death reduction is found slower than under-5 death. Similar to under-5 mortality rate, maternal mortality ratio (MMR) also declined almost 50% since 1990 to 2013. In 1990 worldwide 532,000 women died due to pregnancy cause and in 2013 the estimated number of these deaths was 303,000.

Although, the progress towards achieving the MDG-4 and MDG-5 is appreciable, however, globally the number of under-5 and maternal deaths is still high especially in LMICs. Among 189 countries 62 has achieved MDG-4, however, only 9 of 95 countries who had MMR more than 100 in 1990, achieved MDG-5. Inequity among the gender, poor and rich and, rural and urban was revealed as the main barrier towards achieving the MDG-4 and MDG-5 (10-11).

After 15 years of declaring MDGs, in September 2015 at New York, the United Nations Summit declared the Sustainable Development Goal (SDGs), which included 17 goals and 169 targets (16). The SDGs are developed on the basis of achievements and challenges of MDGs. After analysing the progress towards achievement of MDGs it was revealed that some of the goals stayed behind the target, especially maternal and child health. To address the huge burden of maternal, under-5 and newborn deaths, SDG-3 is developed and the goal is to “Ensure healthy lives and promote well-being for all at all ages”. Reducing maternal deaths to less
than 70 in 100,000 live births and under-5 and newborn deaths to less than 25 and 12 per 1,000 live births respectively; and achieving global health coverage through access to quality basic health care services by 2030 are the three of the indicators of SDG-3.

2.4.1 Maternal and newborn health in Bangladesh

Although, the progress towards the MDG-4 and 5 is appreciable, however, Bangladesh is considered as one of the 10 countries, which are responsible for 59% of global maternal deaths and a country of high under-5 deaths (5). Presently, the maternal mortality rate is 170 per 100,000 live births (11). The burden of newborn deaths is also a challenge for the country. Newborn mortality rate is 24 per 1000 live births. These newborn deaths are responsible for 62% of all under-5 deaths (10).

According to definitions of ICD 10 maternal death is defined as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes (53). According to definitions of ICD 10 maternal deaths is classified as follows:

**i. Direct obstetric death which included:** death resulting from obstetric complication
   a. Haemorrhage
   b. Eclampsia
   c. Obstructed
   d. Infection
   e. Abortion related

**ii. Indirect obstetric deaths:** deaths from previous existing disease
   a. Cardiovascular disease aggravated by pregnancy/delivery
   b. Respiratory disease aggravated by pregnancy/delivery
   c. Anaemia
   d. Other diseases

According to WHO, 75% of maternal death occurs due to direct causes of pregnancy severe bleeding, infections, high blood pressure during pregnancy (pre-eclampsia and eclampsia), obstructed labour and unsafe abortion. The remainder are caused by or associated with diseases such as malaria, and AIDS during pregnancy (54).
In Bangladesh more than half (58%) of the mother die due to haemorrhage, eclampsia and obstructed labour (55). Most of these complications develop during pregnancy, which are preventable and treatable. Other complications may exist before pregnancy but are worsened during pregnancy, especially if not managed as part of the woman’s care. The causes of maternal deaths in Bangladesh are illustrated in figure 4.

![Figure 4: Proportion of maternal deaths by causes in Bangladesh](image)

Prematurity (45%), birth asphyxia and birth trauma (23%), and Sepsis and other infections (16%) are the notable causes of newborn deaths in Bangladesh (figure 5) (57). Most of these newborn deaths can be prevented if the mothers receive regular antenatal care, deliver their newborn at hospitals and seek postnatal care. However, most of the mothers and newborns do not receive these cares due to lack of skilled health professionals and inadequate obstetric and neonatal care services across Bangladesh.
Reasons for maternal and newborn deaths in Bangladesh
There are various reasons for maternal and newborn deaths in Bangladesh. Socio-economic and demographic context and quality of MNH care services demand attention for reducing these deaths.

a. Low educational status: Education enhances women towards the knowledge and understanding about their human and health rights. In Bangladesh, among the women aged 15 to 49 years, the percentage of never attending school is more than one fourth (28%) and only 18% completed their primary education (57).

b. Early marriage and teenage pregnancy: In Bangladesh early marriage and teenage pregnancy are the major causes of maternal and newborn deaths. About three-quarters of marriage among the women aged 20 to 49 years occurs by 18 years of age (57).

One of the major public health concerns for Bangladesh is teenage pregnancy and motherhood. About one third of these teens give birth between 15 to 19 years and this proportion is higher in rural than urban areas (32% and 27% respectively). These girls are very much prone to develop severe complications during pregnancy period and delivery time which

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**Figure 5: Proportion of newborn deaths by causes in Bangladesh**
may come to an end with severe morbidity and mortality of them and their newborns (57)

c. In adequate number of visits for antenatal care and postnatal care services: To reduce the maternal and newborn morbidity and mortality, antenatal care (ANC), care during delivery and postnatal care (PNC) play a vital role.

According to WHO every pregnant woman should visit at least 4 times for ANC services. However, this number of visit is very low in Bangladesh. The recent data shows that only 31.2% of pregnant women received 4 or more ANC and the percentage is uneven between the rural and urban women (26.1% and 45.5% respectively). About two-thirds (64%) of all pregnant women received this service from medically trained personnel (57).

A large proportion of mothers and newborns die during this period. Globally, almost one million newborns die within 24 hours of their birth. Through postnatal checkups it is possible to assess and treat the delivery complication and counsel mothers on how to take care of themselves, as well as their newborns. Therefore, the first 48 hours of delivery is very important to monitoring the complications of the mothers and newborns. However, the proportion of mother and newborns who receive postnatal care from medically trained personnel within 48 hours is very low in Bangladesh (34% and 32% respectively) (57).

d. Low hospital delivery: Every woman has the right to deliver her child in a safe hygienic environment under the supervision of a skilled health professional. Safe delivery can prevent complications related to delivery namely birth trauma, postpartum haemorrhage and infection, and thus reduce maternal and newborn morbidity and mortality. However, according to Bangladesh Demographic and Health Survey 2014, only 37% of delivery took place in hospitals and among them only 13% delivery was conducted in government hospitals. There was inequity between the rural and urban women regarding hospital delivery. The proportions of hospital delivery in urban and rural areas were 56.8% and 30.6% respectively (57).

e. Home delivery and untrained attendants at birth: To reduce maternal and newborn mortality it is essential to conduct the delivery by a trained
health care provider. In Bangladesh, 62% of births are delivered at home and among them only 42% were attended by medically trained personnel. Thirty eight percent of home delivery is conducted by untrained traditional birth attendants (TBAs), 10% by trained TBAs and 7% by relatives or friends (57).

f. Lack of practice of essential newborn care
Most of the newborn death can be prevented by providing essential newborn care which comprises of:

1. Basic newborn preventive care: care before and during pregnancy, clean delivery practices, temperature maintenance, eye and cord care, early and exclusive breast feeding;
2. Early identification of danger signs and proper referral and care seeking
3. Management of birth asphyxia and sepsis

Essential newborn care in Bangladesh focuses on cutting the umbilical cord with clean blade, cord care, keeping the baby warm, delayed bathing and initiation of breast feeding just after birth. All the mentioned practices are cost effective and do not require highly trained health care providers and sophisticated instruments. However, only six percent of newborn receive all five recommended essential newborn care practices (57).

2.5 Health system of Bangladesh: district and sub-district level
The Ministry of Health and Family Welfare (MOHFW) is the highest government body for health care system in Bangladesh (58). The MOHFW is responsible to develop health policies and its implementation framework in terms of provides quality health services accessible for the whole population. The health care system of Bangladesh is very unique and provides health care through six tiers including national, divisional, district, upazila (sub-district), union and ward. There are two directorates namely Directorate General of Health Services (DGHS) and Directorate General of Family Planning (DGFP) which work separately under the direction of MOHFW (figure 6).

In district level both directories have their own infrastructures, which are defined as the secondary level hospitals. Under DGHS district hospitals provide advanced care and specialist services in medicine, surgery, obstetrics & gynaecology, paediatrics, ophthalmology, clinical pathology, blood
transfusion and public health services. The MNH care is provided through obstetrics & gynaecology and paediatric departments of the hospitals. These hospitals comprise of 50 to 200 beds. Maternal and Child Welfare Centres (MCWCs) are also secondary level hospital but provide Emergency Obstetric Care (EmOC) only which comprise of 20 beds. MCWCs are under DGFP. Secondary level hospitals are the referral point of sub-district and below level health facilities (3).

In sub-district level Upazila Health Complexes are considered as primary health care centre and the first referral point with bed capacity of between 31 and 50. Union Health and Family Welfare Centres and Community Clinics at union level are also under primary health care (4).
Figure 6: Types of facilities from national to ward level with facility hierarchy
Our studies focused on district and sub-district hospitals covering both secondary and primary level care respectively (32,59). The flow chart of different tiers of national health system is given over-leaf (figure 6).

2.6 Maternal and newborn health services in Bangladesh

Current Government service delivery includes comprehensive emergency obstetric services at most of the district hospitals and some upazila health facilities, and obstetric first aid at the union level. The Government is keen to expand Emergency Obstetric Care (EmOC), community-based Skilled Birth Attendants (SBA) training, Integrated Management of Childhood Illness (IMCI) and other programs to improve maternal and newborn health services at all levels of the national health system. Comprehensive Emergency Obstetric Care (CmEOC) services are available in 59 District Hospitals, 58 maternal and child welfare centres (MCWCs), some 132 Upazila Health Complexes (sub-district level hospitals) and all tertiary care centres. This is one of the major national programmes to save women’s lives during obstetric complications. Community services are provided through planned outreach activities and home visits. Community Clinics have been established in parts of the country, as one-stop service centre. Ministry of Health and Family Welfare (MOHFW) is also piloting demand-side financing in the form of maternal health voucher scheme in 33 upazilas to increase poor women’s’ utilization of quality MNH services. NGO health workers and volunteers also visit households to provide health education, preventive and curative health services related to newborn care. In addition, many Village practitioners, private doctors, and a large number of non-formal providers exist at community level providing care for most of the poor, rural women and their children (58, 60).

Since 2010, with the technical support of CIPRB and UNICEF in Bangladesh, Directorate General of Health Services (DGHS) in collaboration of Directorate General of Family Planning (DGFP), MOHFW have been conducted an evidence based approach “Maternal and Perinatal Death Review (MPDR)” covering maternal and perinatal deaths and still births in both the community and at hospitals which cross checks both health system and social factors (61). Deaths occurred in hospitals and community levels were identified and with multicolour dots these deaths mapping were done at the upazila level. At the same time verbal and social autopsy were conducted to identify the causes of these deaths which could be prevented. Through social autopsy the factors influencing the causes of delay...
to seek health care services and to access it at time were identified. Hospital death reviews identified the gaps and challenges which manipulate the maternal and newborn deaths occurred in hospitals. Analysing the findings the district and upazila health managers take necessary actions to address the gaps and challenges which causes deaths. The Government of Bangladesh scaled up MPDR to 12 districts with 70 upazilas covering almost 24 million people of the country (62).

With the collaboration of DGHS and DGFP, Liverpool Tropical School of Medicine (LSTM), UK have been implementing an intervention programme namely ‘Making It Happen’ (MiH) in Bangladesh since 2009 (63). The objective of this programme is to increase the quality of MNH care through providing training on emergency obstetric care and early newborn care (EOC&NC), monitoring, supervision and data management. Since 2013, CIPRB with the technical support of LSTM has been implementing MiH in six districts and already trained 731 consultants, doctors, nurses and FWVs on EOC & NC (64). This programme also created 110 master trainers and 10 course directors who would conduct the programme at scale. Monitoring and evaluation, and data management training were provided to 148 health care providers. It is expected that through this programme availability and quality of skilled birth attendances and EOC&NC will be increased and thus maternal and newborn deaths could be prevented.

Worldwide 60 countries with low resource settings have been implementing “Helping Babies Breath (HBB)” programme to strengthen the management of newborn resuscitation and as a result to reduce the newborn morbidity and mortality (65). Through this programme, training has been provided to the health care providers on how to care a newborn within the first minute of delivery and help the babies who born with breathing difficulties. “The Golden Minute” is the key concept of HBB. Within the first minute of life, a newborn should breathe well or should be ventilated with a bag and mask. It is an evidence based programme initiated by the American Academy of Pediatrics (AAP) in collaboration with Save the Children, the World Health Organization (WHO), US Agency for International Development (USAID) and a number of global health stakeholders. This programme is piloted in Bangladesh in 2010 and scaled up through the engagement of Ministry of Health and Family Welfare (MOHFW), non-government organizations (NGOs), medical professional societies, IN-
ICEF and Bangabandhu Sheikh Mujib Medical University (BSMMU). HBB programme is covered 70% of the districts of Bangladesh and 1700 health facilities are equipped with the bag-mask resuscitators and suction bulbs. 17,000 birth attendants are trained up under this programme.

All the three above mentioned intervention programmes (MPDR, MiH and HBB) have been implemented through the existing health system.

### 2.7 Rationale of the studies

Similar to other LMICs, the maternal and newborn care deserves much attention in Bangladesh. Although progress has been made on the State of the Art related to prenatal, delivery and postnatal care, however, challenges still remain for implementation at scale. The commonly perceived constrain lies in the “quality of care” provided by government hospitals especially in maternal and newborn health (24). A few studies carried out in Bangladesh identified that the quality of maternal and newborn health care is low (20-22). Inadequate skilled human resource, lack of supply and logistics, poor attitude and behaviour of service providers toward clients, lack of cleanliness, long waiting time and patient load are considered as the reason for the poor quality of services.

Quality of health care is about adhering to evidence-based standards and maximizing the desired performance at service delivery sites and within the communities. Quality of MNH service at the district hospital involves a state of 24-hours/7-day-a week readiness with functional equipment, supplies and adequate infrastructures. It also needs effective links between the primary health care service (upazila health complex) and the referral district hospitals in the form of effective organisation, efficient service delivery and timely communication and transportation to the referral hospitals. The first referral level hospital is also expected to be receptive to the needs of primary health care facilities and its infrastructure in timely initial management of women and newborns with complications, through improving clinical skills of health care providers at the primary level. Further, avoiding unnecessary delay at primary health care level, inappropriate non-evidence based practices and inefficient use of resources among others, exert a significant impact on pregnancy outcome both for mothers and newborns.
Introduction of QI system at the district and sub-district level hospitals can help to improve MNH care services that would contribute to prevent maternal and newborn morbidity and mortality. This eventually would contribute in achieving Millennium Development Goals MDG-5 (reducing maternal death) and to attain the goal of SDG-3 by 2030.

In order to address the barriers and challenges of providing quality MNH care at the district and sub-district level hospitals, a comprehensive QI system for MNH care is essential. To develop such a system it is necessary to assess the current quality of care at those hospitals. As there is no unique model of QI agreed on globally, a model needs to be developed and evaluated, considering the findings of the current low quality of MNH service showed in outcomes from reviews of evidence based QI intervention programmes, implemented in both HICs and LMICs.

Moreover, it is important to implement the QI model in district and sub-district level hospitals and to evaluate its acceptability and feasibility by both service providers and patients.
3 Objectives

3.1 General objective
To develop a Model QI System for MNH care at the district and sub-district level government hospitals in Bangladesh based on the information on existing situation of quality of care, and perception and views of various stakeholders. The model was implemented and evaluated considering Bangladesh context.

3.2 Specific objectives
a. To explore the perception of healthcare providers regarding the quality of their MNH care, as well as to investigate patients’ satisfaction with MNH care in the district and sub-district level government hospitals in Bangladesh (Paper I).

b. To assess the quality of infrastructure and performance of the healthcare providers during MNH care provided at district and sub-district level government hospitals in Bangladesh (paper II).

c. To develop a “Model Quality Improvement (QI) System” for MNH care applicable for district and sub-district level government hospitals in Bangladesh (paper III).

d. To implement and evaluate the acceptability and feasibility of the “Model QI System” for MNH care at district and sub-district level government hospitals in Bangladesh (paper IV).
4 Methods

To address the objectives of the papers included in the thesis, we utilised mixed methods including qualitative and quantitative approaches. Two district hospitals, two maternal and child welfare centres (MCWCs) and ten upazila health complexes of Thakurgaon and Jamalpur districts of Bangladesh were included as study settings (Figure 7). The study settings were selected purposively in consultation with World Health Organization (WHO) Bangladesh country office.

**Thakurgaon district**

Thakurgaon is situated in the northern part of Bangladesh with an area of about 1809 sq km. The geographic units are five upazilas and 51 unions. The five upazilas are Thakurgaon Sadar, Baliadangi, Ranisankail, Haripur and Pirganj. The projected population of Thakurgaon is about 1,400,000 (66).

**Jamalpur district**

Jamalpur district is situated in the north east part of Bangladesh with an area of 2,115 sq km, consists of seven upazilas, and 68 unions. The seven upazilas are Jamalpur Sadar, Bakshiganj, Dewanganj, Islampur, Madarganj, Melandah and Sarishabari. The population of Jamalpur district is about 2,292,674 (66).

Among the study settings both the district hospitals and maternal and child welfare centres are considered as district level hospitals. The district hospitals are also identified as the secondary level hospitals with 100 beds where more advanced care and specialist services in medicine, surgery, obstetrics and gynaecology, paediatrics, ophthalmology, clinical pathology, blood transfusion and public health services are provided (3). Maternal and Child Welfare Centres are also secondary level hospital with 20 beds and provide emergency obstetric care and other related services like antenatal care and family planning (4). In Bangladesh upazila health complex is considered as primary health care centre and the first referral point with
bed capacity of between 31 and 50 and serves a population of between 200,000 and 400,000 (3).

Table 3: Description of the selected hospitals by districts

<table>
<thead>
<tr>
<th>Districts</th>
<th>Name of hospitals</th>
<th>Population coverage</th>
<th>Total beds</th>
<th>No of Beds</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Maternity</td>
</tr>
<tr>
<td>Thakurgaon</td>
<td>District Hospital</td>
<td>538,075</td>
<td>100</td>
<td>33</td>
</tr>
<tr>
<td></td>
<td>MCWC</td>
<td>538,075</td>
<td>20</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Baliadangi UHC</td>
<td>199,660</td>
<td>50</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Haripur UHC</td>
<td>217,037</td>
<td>50</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Pirganj UHC</td>
<td>259,023</td>
<td>50</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>Ranisankail UHC</td>
<td>142,776</td>
<td>50</td>
<td>13</td>
</tr>
<tr>
<td>Jamalpur</td>
<td>District Hospital</td>
<td>658,464</td>
<td>250</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>Jamalpur MCWC</td>
<td>658,464</td>
<td>20</td>
<td>15</td>
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<tr>
<td></td>
<td>Dewanganj UHC</td>
<td>272,835</td>
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<td>Islampur UHC</td>
<td>328,732</td>
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<td>Sarishabari UHC</td>
<td>341,282</td>
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<td>Melandah UHC</td>
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<td>Bakshiganj UHC</td>
<td>202,267</td>
<td>31</td>
<td>7</td>
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<tr>
<td></td>
<td>Madarganj UHC</td>
<td>276,587</td>
<td>31</td>
<td>5</td>
</tr>
</tbody>
</table>

Our research comprised of i) a survey to assess the existing quality of MNH services of the selected hospitals; ii) document reviews and workshops to develop a “Model QI System” including implementation framework, guidelines and tools; and iii) pilot of the developed “Model QI System. The purpose of carrying out this research was to implement and evaluate the “Model QI System” in terms of feasibility and acceptability by the health care providers and beneficiaries. It was a multiphase research conducted since 2011 to 2014.
The “Model QI System” was developed on the basis of evidence based QI programmes implemented in the developed and developing countries effectively (27, 31, 67-83). Country and cultural context, health care providers and patients’ socio-economic background, hospital resource and capacity, and patient load were taken into consideration. Six WHO building blocks of continuous capacity building were the basis of the implementation framework where health system worked for quality improvement through building facility readiness, and providers’ skill improvement, and coordinated actions (84-85).

We utilised mixed methods for paper I and paper IV of the thesis and for paper II we deployed quantitative methods. Paper III was a description of the process of development of the “Model QI System” including implementation framework, guidelines and tools.

To address the objectives more comprehensively, we utilised mixed methods, which integrated both quantitative and qualitative approaches. Here, qualitative approaches were adopted to complement the quantitative approaches and provide deeper understanding of the issues. We utilised concurrent triangulation design to confirm, cross validate and support the findings of both the approaches (86-87). Another purpose of using this design was to collect data in a shorter period. Concurrent triangulation design is one of the most common mixed method design utilised by the health science researchers. Within this design quantitative and qualitative methods are used separately to provide strength to each other, concurrent happens during data collection and integrates the results during interpretation (88-89). By following the concurrent triangulation design, convergence of the findings during interpretation took place to strengthen the information and knowledge obtained in our studies. As a result, comprehensive persuasive evidence was generated through our research.

Different types of data collection techniques were used to obtain the primary data. Through structured observation and exit interviews quantitative data were obtained. To extract information on the existing situation of quality of care in terms of hospitals infrastructures, human resource status and clinical performance of health care providers we conducted observations. Exit interviews were conducted with the mothers of newborns or their attendants who experienced hospitals MNH services at least three days before discharge. On the other hands group discussions, focus
group discussions, in-depth interviews, document reviews and photography were included to obtain qualitative data in the form of sentences, words, expression, impression and images. Group discussion, focus group discussions and in-depth interviews were conducted with top health managers, health care providers, laboratory technicians and ancillary staff as they had wide knowledge, experiences and in-depth understanding about the MNH services. These types of respondents are called as “information rich respondents” (90).

We utilised open-ended semi structured checklists to obtain qualitative data and close ended structured questionnaires for quantitative data. Close-ended questionnaires were used to collect information where the responses were straight forward. Open-ended semi-structured checklists were deployed to permit the respondents liberty to express their understandings and opinion about the quality of MNH services. The respondents provided detail information and clarified their views. They expressed their logics over their thinking process and provide adequate answer to multifaceted issues.

In this research we utilised photography as a tool for data collection to identify the areas of improvement and to take decisions accordingly. Images can make an impact easily as it is visible and easy to understand. Figure 8 and table 4 describe the overall methods of the thesis and study design including data collection techniques in brief, which were deployed in different phases of our research which are given over-leaf.
Figure 8: Methodological matrix of the thesis
<table>
<thead>
<tr>
<th>Papers</th>
<th>Objectives</th>
<th>Study design</th>
<th>Data collection techniques</th>
<th>Participants</th>
<th>Data collectors</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>To explore the perception of healthcare providers regarding the quality of their MNH care, as well as to investigate patients’ satisfaction with their MNH care from the district and sub-district level hospitals in Bangladesh.</td>
<td>Qualitative approaches</td>
<td>- Group discussions (GDs) - In-depth interviews (IDIs)</td>
<td>GD: Civil surgeon, deputy director of family planning, upazila health and family planning officer, obstetrician and paediatricians, anaesthesiologist, nursing superintendent, senior staff nurses &amp; family welfare visitor. IDI: Laboratory technician/pharmacist, ward master/nursing supervisor, ancillary staff from the maternal or neonatal wards</td>
<td>- 8 physicians (4 pediatricians &amp; 4 gynecologists) - 4 anthropologists</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Quantitative approaches</td>
<td>- Client exit interviews</td>
<td>Exit interviews: Mothers of newborns or their attendants who experienced hospitals MNH services at list three days before discharge.</td>
<td>- 8 physicians (4 pediatricians &amp; 4 gynecologists)</td>
</tr>
<tr>
<td></td>
<td>To assess the quality of infrastructure and performance of the health care providers during MNH care provided at district and sub-district level hospitals in Bangladesh.</td>
<td>Cross sectional study</td>
<td>Observation of infrastructures: All 14 hospitals along with its infrastructures and logistics  Clinical care performance: Health care providers who provided ANC, PNC, birth and newborn care.</td>
<td>- 8 physicians (4 pediatricians &amp; 4 gynecologists)</td>
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<tr>
<td>II</td>
<td>To develop a “Model quality improvement system” for MNH care applicable for district and sub-district level hospitals in Bangladesh.</td>
<td>Exploratory</td>
<td>Workshop participants: Researchers of CIPRB, national professionals related to MNH services (pediatricians, gynecologists and anesthesiologist), the health programmers of DGHS and DGFP Bangladesh.</td>
<td>-</td>
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<tr>
<td>IV</td>
<td>To implement and evaluate the feasibility and acceptability of the “Model quality improvement system” for MNH care at district and sub-district level hospitals in Bangladesh district and sub-district level hospitals of Bangladesh.</td>
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<td>---------------------------------</td>
<td>-------------------------------------------------</td>
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</tr>
</tbody>
</table>
| Qualitative approaches          | - Focus group discussions (FGDs)  
                                  | - In-depth interviews (IDIs)  
                                  | - Photography  |
| FGD: Civil surgeon, deputy director of family planning, upazila health and family planning officer, obstetrician and paediatricians, anaesthesiologist, nursing superintendent, senior staff nurses & family welfare visitor.  
IDI: Laboratory technician/pharmacist, ward master/nursing supervisor, ancillary staff from the maternal or neonatal wards  
Photography: MNH service points |
| Quantitative approaches         | - Client exit interviews  
                                  | - Structured observation  |
| Exit interviews: Mothers of newborns or their attendants who experienced hospitals MNH services at list three days before discharge  
Observation of infrastructures: All 14 hospitals along with its infrastructures and logistics. |
| - 12 anthropologists            | - 2 District coordinators of CIPRB  
                                  | - 8 data collectors with social science background |
4.1 Data collection and analysis techniques

To obtain quantitative data, observations and exit interviews were carried out. Group discussions (GD), focus group discussions (FGDs) and in-depth interviews (IDIs) were organized to accomplish the qualitative approach. Document reviews were used as one of the major technique to acquired knowledge and information qualitatively. Photography of the selected physical infrastructures of the MNH service points were taken before and during the piloting of the QI system. Along with the above mentioned data collection techniques, we conducted series of workshops as a platform of collection of information for developing the QI system.

4.1.1 Quantitative approaches

Observations

The observation method is one of the most familiar type of data collection techniques to obtain primary data through survey or descriptive studies, specially for health science (91-92). Here, the information is extracted by the researchers’ direct observation. One of the advantages of this technique is absence of subjective bias as verbal reports from HCPs and patients (92-93). Through this technique, investigators obtain information on current situation. Areas of observation, methods of recoding the findings and assuring the accuracy of observation are the important issues for the researchers when they will utilise the observation technique. To obtain quantitative data structured observation is used. Unstructured observation technique can be utilised to extract qualitative information.

In our studies we utilised structured observation technique to assess the quality of infrastructures and the clinical performances of the HCPs when they provided MNH services namely antenatal, postnatal, birth and newborn care. The observation took place in natural settings namely the MNH wards of district hospitals, maternal and child welfare centres and upazila health complexes. The researchers acted as non-participant observers and observed the situations without taking active part in the interaction, i.e. participation in the situation. Gynaecologists and pediatricians were trained to conduct the observation. Subject specialists were selected as observers because they had better knowledge in the selected areas and were able to assess the contents. Different types of observational checklists were utilised during this study, which was developed through a series of workshops. The researchers of CIPRB, national professionals related to
MNH services (paediatricians, gynaecologists and anaesthesiologist), the health programmers and administrators of the DGHS and DGFP, Bangladesh developed these checklists and trained the observers as well.

Exit interviews
Worldwide exit interview of the patients is considered as one of the important data collection methods to assess the patients’ satisfaction level on health services. Patients’ experiences and opinions play a major role to assess the quality of services of hospitals (94). To develop an intervention program for improving the quality of a hospital, it is crucial to understand the existing status of quality of health services and the needs and expectations of the patients from this hospital. Findings obtained from various health research evidenced have shown that client satisfaction survey through exit interviews is a non-expensive informative way to explore the areas for service improvement. The data obtained from exit interviews are considered sound, as exit interviews are conducted just after having their care experiences (95). This type of data-collection technique is becoming popular in developing countries including Bangladesh (96).

We conducted exit interviews thrice with the patients of the selected hospitals to assess their satisfaction levels with the MNH services they received. First time, exit interviews were conducted in first phase of the research to explore the areas of services where dissatisfaction of the patients was revealed. Patients’ satisfaction level is mostly affected by the quality of services and access to those services on which the acceptability and sustainability of an intervention programme depends. In the third phase of our research we piloted “Model QI System” to evaluate the feasibility and acceptability of the system by the HCPs and patients. Just before and after piloting the programme, we carried out exit interviews twice to explore whether there was any change in patterns of patients’ satisfaction level with the quality of services due to QI programme implementation.

4.1.2 Qualitative approaches
In health sciences different types of group discussions and in-depth interviews are commonly used as data collection technique. Both methods are used by the researchers to explore the deeper understanding, perceptions, knowledge, and beliefs of the respondents, which are not possible to reveal through quantitative approaches. These methods explore common phe-
nomena met by the health managers, HCPs and the clients. However, in-depth interview and group discussion are two separate types of techniques and selection of the technique depends on the objectives of the studies and type of participants. The researchers conduct series of interviews and discussions till the saturation of the information takes place (97).

In the first phase of our research, we conducted in-depth interviews and group discussions. The purpose of the first phase of the studies was to explore the HCPs perception on quality MNH services and to find out the areas where quality needed to improve and to develop a “Model QI System” including QI implementation framework, guidelines and tools based on the findings. At the end of the research, focus group discussion along with in-depth interviews was conducted to evaluate the “Model QI System” to explore its feasibility and acceptability by the HCPs and patients. Participants of interviews were selected purposively. To obtain in-depth understanding about the selected topics, it is essential to conduct interviews among the people who have deeper knowledge and understanding of the issues. This is the reason why purposive sampling is popular among the qualitative researchers (90). Anthropologists as social scientists and physicians as subject specialists were recruited to conduct the qualitative part of our research. The senior anthropologists and researchers of CIPRB conducted extensive training. During training it was assured that the researchers obtained enough background knowledge about the topics. We used open-ended semi-structured checklists to offer the participants freedom to talk. As a result they reported the important gaps and barriers, which were responsible for low quality of care.

In-depth interviews
To explore the individual respondent’s personal experiences, views, feelings, knowledge and ideas on the topics, we conducted in-depth interviews. It is always better to conduct an individual in-depth interview when the participants feel discomfort to express his perception and beliefs in front of groups or when it is difficult to gather a group in a particular time (98). We conducted in-depth interviews with hospital support staff and ancillary staff namely laboratory technicians, pharmacists, ward masters, nursing supervisors and cleaners. They performed different types of responsibilities related to health care services. To address our objectives we selected the participants from different tiers as they could provide us information from the different perspectives and corners. We wanted to ob-
tain their individual views on quality of care and what they perceived in terms quality of MNH services provided by them to the patients, which may not be possible to find out through focus group discussions. Open-ended semi-structured guidelines were utilised here. The researchers used different types of probes, paraphrases and sometimes summarise of the participants’ comments to keep continue the discussion and focused on topics.

**Group discussions and Focus group discussions**

We adopted both focus group discussions (FGDs) and group discussions (GDs) as qualitative data collection techniques. Both the techniques are almost same, however, group discussion is more informal than the focus group discussion.

**GDs:** During the first phase of our research we used group discussion with the HCPs to assess their perception on quality of MNH services they provided to the patients of the selected hospitals. We wanted to explore the status of quality of MNH services of the hospitals through the GDs. To develop our QI intervention programme “Model QI System”, it was crucial to explore the areas of improvement, find out the barriers and challenges which might be addressed during implementation of the programme. Keeping these in mind GDs were conducted with top health managers and health care providers namely clinicians from MNH wards and nurses/family welfare visitors. These professional groups were involved directly with the decision making, regarding health related services, as well as provided health services to the patients simultaneously. Similar to FGDs, the researchers conducting GDs act as a moderator without participating in discussion. Although we utilised both deductive and inductive approaches, however, emphasises were given more in inductive approaches. Our purpose of conducting GDs was to identify common themes related to the main topic quality of MNH services. Group discussion is usually used to collect preliminary information on the topics and to have deeper understand behind the science (98).

**FGDs:** At the end of the pilot of “Model QI System”, we deployed FGDs to evaluate the system in terms of feasibility and acceptability of the programme by the health care providers related to MNH services. As per O’Neill, et all FGDs are one of the most useful data collection approaches for evaluation of a programme (99). The categories of the participants
remained the same as the participants of GDs conducting in first phase of our research (59). Here we utilised deductive type approaches (96). The open ended semi-structured FGD guidelines were made by incorporating selected themes. The top health managers and health care providers who involved directly in the pilot of the QI programme were selected purposively as participants of FGDs. Through FGDs we explored their experiences and views whether the QI system were feasible to implement and acceptable to them. Neuman and Samy described in their books on social science related to social science and research methodology, that in FGDs individual respondents views and experiences use to encourage other respondents to express their views and experiences (90, 98). We have taken this advantage in consideration to explore HCPs perception regarding the QI system piloted in their settings.

Documents review
Documents review is one of the data collection techniques in qualitative research (100). Both printed and electronic materials are utilised as documents. Systematic procedure is followed to review and evaluate the documents. The researchers obtain deeper understanding and enrich their knowledge on a topic through coding the contents of the documents into themes (101). In qualitative research, documents review plays an important role through its multidirectional functions. Extracted data from documents used as background information usually provide hint on the context that need to be address in a research. Through documents review the researchers can track the change and development of the subject of their interest, as well as reveal the gaps between the existing knowledge. Information retrieved from past events help to generate new ideas. Document review as a data collection technique is less time consuming and cost effective as data need not to be collected, rather selected.

In our research, documents review had a major contribution, especially in the “Model QI System” development phase. We reviewed journal articles, gray literatures, reports and documents related to quality improvement of health services. Our objective of document review was to obtain information on different types of intervention programme already conducted in developed and developing countries including Bangladesh. Both electronic and non-electronic searches were used to select the documents. Government and non-government health officials of Bangladesh related to MNH services provided the gray literatures and documents where the
experiences on quality improvement of health services of Bangladesh were described. To select journal articles we conducted systematic search to review literature on quality improvement programme. We reviewed article published in English within the time frame of 1980 to 2012 (27,31, 67-83). To meet the objective of the documents review, different types of keywords and keyword combinations were used to find out the relevant articles, which were synthesized.

PubMed, Google Scholars and HINARI were used as search engines. We utilised MeSH Terms “Quality improvement” and “Hospitals”, “Maternal welfare”, “Infant, newborn” “Health”, “Developing countries” and “Developed countries” and “Intervention”. During PubMed advanced search and Google Scholars we also used key words namely “PDCA model”, “5S KAIZEN approach” and “TQM”.

Photography
In recent years researchers become familiar to utilize images through photography as a tool of visual methodology in social science. Traditionally, images are utilised as illustration of text without concrete analysis of the photographs and usually utilised as a part of mixed type data collection methods.

Throughout the intervention programme our district coordinators of CIPRB captured images to obtain pictorial data to explore if changes have occurred. We utilised images, as images need to show only and nothing to be stated. Instead of textual language, images are able to reveal the inner meaning of the event (102). Another advantage of taking images is the images are more attractive and easy to remember than academic text and easily influence the person to think and take decision over the events.

Trustworthiness
During our research we carefully followed Lincoln and Guba’s trustworthiness criteria of qualitative research namely i) credibility; ii) transferability; iii) dependability; and iv) confarmability (103).

To make the research credible, before data collection we, researchers and data collectors, visited the selected hospitals, conducted meetings with the top health managers and health care providers to build rapport with them, as well as to make ourself familiarise with the settings. For triangulation
we utilized different types of data collection techniques namely GDs, FGDs, IDIs, documents review and photography. We interviewed only those persons who willingly and enthusiastically wanted to take part in the interviews. Rapport was built and the participants were ensured that they could withdraw at any point of interview session. To obtain the detail information we utilised probes and sometimes rephrased the questions. We, including researchers and data collectors, conducted debriefing sessions frequently. In these meeting the data collectors described their experiences. Sometimes we suggested alternative approaches in terms of probing and questioning to obtain more valid information. As the main instrument of the qualitative research is the researcher himself, all the researchers of this research had medical background with experience on qualitative research. All above mentioned measures ensured the inter validity of our research.

Transferability is one of the major concerns of the research as one of the success of the research is to apply the findings to other situations and thus ensure the external validity of the research process. To make our research transferable, we detailed about context where the research took place, participants, data collection methods along with the number and duration of each type of data collection session. The time period over which data was collected also described here.

We described our research design of all the studies and its implementation plan including data collection methods in a way so that the whole research could be understandable to the readers. To make the research dependable we emphasised on developing the strategies of execution of the intervention. We assumed that the result would be same if this intervention programme would be implemented in the same context utilising the same methods where the participants would remain same as before.

We utilised different types of data collection techniques. The results and recommendations were made on the basis of respondents’ experiences and ideas. Through photography, we showed the result in terms of changes in quality of MNH service points. Our research findings, interpretations and recommendations were supported by data. Researchers’ characteristics and preferences did not influence our result. Thus we ensure the conformability of the research.
4.1.3 Analysis techniques
The groundwork for integration of quantitative and qualitative methods of the research was started from the very beginning of the research while study purpose and objectives were formulated. Tools for both qualitative and quantitative data collection were developed focusing on quality issues related to MNH services of the hospitals and the social, economic and cultural contexts were considered. Conversion of both the approaches occurred by quantising narrative data and qualitising the numeric data. Then the understandings were linked, combined and integrated. Comparisons of both types of findings were performed to converged and diverged. Finally, we integrated the results achieved from both the qualitative and quantitative methods during interpretation of the outcomes of our research.
4.2 Study methods and data analysis

4.2.1 Paper I: HCPs’ and patients’ perception on quality of care

Study design
We have deployed mixed-method including both qualitative and quantitative approaches. As a part of qualitative research we conducted group discussions (GDs) and in-depth interviews (IDIs) with the health care providers to explore their perception on the quality MNH of care they provided. To assess the satisfaction level of the patients who received MNH services we adopted exit interviews as a survey tool of quantitative approach.

Study duration
The study was conducted during November and December 2011.

Study settings and study population
Two district hospitals, two maternal and child welfare centres and ten upazila health complexes of Thakurgaon and Jamalpur districts were selected purposively as study settings (table 2).

All fourteen hospitals along with its infrastructures, the health care providers and patients related to MNH services were selected as study population.

Study participants
GDs: Top health managers, health care providers, nursing superintendents and nurses and family welfare visitors were selected as GD participants. The number of participants ranged from 7 to 8 for each GD. We conducted total fourteen GDs, one from each hospital (table 4).

IDIs: Four IDIs were conducted in hospitals where hospital support staff and ancillary staff from MNH wards (table 4) were the participants.

Exit interviews: Mothers of newborns or their attendants who had received services from maternal, labour, and neonatal wards at least 3 days before discharge were selected as the respondents of exit interviews. We included attendants in case of absence of mother of discharged newborn
or when the mother was not in condition to participate in interviews due to their general discomfort or weakness (table 5).

**Table 5: List of participants by types of data collection methods**

<table>
<thead>
<tr>
<th>Methods &amp; numbers</th>
<th>Participants</th>
</tr>
</thead>
</table>
| GDs: 14 (One group from each hospital) | From district hospitals: Civil surgeon, obstetrics and paediatrics consultants, anaesthesiologist, nursing superintendent, and two senior staff nurses  
From MCWCs: Deputy director of family planning, anaesthesiologist, medical officer, one nurse, and one family welfare visitor  
From UHCs: Upazila health and family planning officer, obstetrics and gynaecology specialists, paediatrician, anaesthesiologist, resident medical officer, and one nurse |
| IDIs: 56 (Four interviews from each hospital) | From district hospitals, MCWCs, and UHCs: One laboratory technician/pharmacist, one ward master/nursing supervisor, one ancillary staff from the maternal or neonatal wards, and one cleaner |
| Exit interviews: 112 (Eight exit interviews from each hospital) | Patients or their attendants from maternal, labour, and neonatal wards at district hospitals, MCWCs, and UHCs who received care at least three days before discharge from the hospitals |

**Research instruments**

All types of instruments utilised in the study were developed through workshops attended by the researchers of CIPRB, obstetricians, paediatricians, and programme personnel related to MNH services from the Ministry of Health and Family Welfare, Government of the People’s Republic of Bangladesh. Both the structured and semi-structured questionnaires were first developed in English and later translated into Bangla for the use of the respondents. To check its internal validity, the Bangla version was back translated into English. Before finalizing all types of instruments were pretested in a government hospital not included in the study.
Qualitative: In conducting GDs and IDIs, semi-structured open-ended questions with probes were used to permit the respondents’ liberty to express their understandings about the quality of MNH services. To explore their perception on quality of health services provided by them to the patients, the researches asked questions with probes on certain areas namely human resources, workload, patient turnover, logistics and laboratory support, patient-management protocols, training, supervision, and rewards and appreciations.

Quantitative: A structured questionnaire was utilised to conduct the exit interviews. To assess the satisfaction level of the patients we included questions on waiting time to receive care, cleanliness of the hospital, drug supplies, time given by healthcare professionals and the opportunity to ask questions, and impression on overall MNH services provided to the patients.

Data collection techniques

Qualitative: Teams comprised of two physicians and one anthropologist collected the data. Four teams were involved in the data-collection process and they received three days of training from the investigators before they conducted GDs and IDIs. The teams visited each hospital to collect relevant data. The interviews were audio taped and handwritten notes were made. In each type of session, a facilitator requested one of the participants to express his/her perception about the MNH services provided to the patients from their healthcare facility. This was an ice-breaking exercise as well as a thought-provoking mechanism for the participants. The facilitator then gradually introduced a series of prompts to encourage discussion about their perception on the quality and availability of healthcare infrastructure, cleanliness, services, training, and adequate personnel and logistics, laboratory support, use of patient-management protocols, and the necessity of training and supervision. The GDs and IDIs continued 120-150 minutes and 30 to 40 minutes respectively. Every interview was audio recorded and interview notes were taken. The anthropologists accomplished 14 GDs and 56 IDIs to address the objectives of the study.
Quantitative:
Trained teams consisting of two physicians collected the data. Four teams were involved in the data-collection process. The teams visited each hospital and interviewed the patients or their attendants who were discharged but still present within the hospital premises. A total of 112 exit interviews were conducted, with eight from each hospital.

Photo 1: Exit interview with a mother at district level hospital, Jamalpur

Analysis
Mixed methods including quantitative and qualitative approaches were deployed in the research.

Quantitative data analysis: Descriptive analysis was performed to analyze the quantitative data. The data were entered into Epi-Info (Centres for Disease Control and Prevention, Atlanta, GA) and analysed by both Epi-Info and SPSS (version 17; SPSS Inc, Chicago, IL). The mean age and percent distribution of the client’s satisfaction level were calculated. The Chi-squared test for p value was calculated to obtain the significance of the differences in the various areas of satisfaction levels of the clients in different hospitals.

Qualitative data analysis: GDs and IDIs were conducted as a part of qualitative research. To analyse the qualitative data audio recordings were transcribed independently by anthropologists. Transcriptions were made in Bangla and subsequently were translated into English. All the transcriptions were compared for accuracy by the researchers independently. After conducting a meeting with the researchers and data collectors the English transcriptions were finalised. Every difference and exceptions were addressed. Coding and categorization of the data were done by developing a checklist matrix where meaning of text were emphasised. Further analy-
sis of these simple categories, themes and sub-themes were identified. Under each theme and subtheme, every response were piled and then the similarities and dissimilarities were identified and compiled in general statements. Thematic analysis was done. After sorting and categorizing the responses, excerpts from the transcripts were chosen to illustrate the summary statements, which were used to validate the findings.

4.2.2 Paper II: Infrastructure and clinical care performance assessment

Study design
The study deployed cross sectional survey to measure the quality of infrastructures and assess the performance of the HCPs related to MNH care.

Study duration
The study period was between November and December 2011.

Study settings and study population
Study settings of the study were two district hospitals, two maternal and child welfare centres and ten upazila health complexes of two districts namely Thakurgaon and Jamalpur. These settings were selected purposively (table 2). Infrastructures of all fourteen hospitals and health care providers of all selected hospitals who provided antenatal care (ANC), postnatal care (PNC), care during labour and newborn care were the study population.

Study participants
For observation 6 MNH point services of all the fourteen hospitals were selected as study population. Health care providers were selected as the participants of the observation of clinical performances when they provided MNH services to the patients. The list of the participants is given overleaf (table 6).
Table 6: List of participants by types of data collection methods

<table>
<thead>
<tr>
<th>Methods</th>
<th>Participants</th>
</tr>
</thead>
</table>
| Infrastructure observation | • ANC and PNC Room in OPD  
• Neonatal/Paediatric Room (OPD)  
• Labour /Delivery Room  
• Maternity Ward (Obstetric ward)  
• Operation Theatre (OT)  
• Neonatal Ward |
| Observation of clinical performances | District hospitals and upazila health complexes  
• Consultants, medical officers and nurses who provided ANC and PNC.  
• Consultants, medical officers and nurses of labour and newborn ward |
| MCWCs                    | • Medical officer, nurses and family welfare visitors                         |

Research instruments
Series of workshops were conducted to develop the instruments, which were utilised to assess the quality of infrastructures of the hospitals and clinical performances of the health care providers. The programme personnel of the Ministry of Health and Family Welfare, Government of the People’s Republic of Bangladesh who were related to MNH services, obstetricians, paediatricians, anaesthesiologists and researchers of CIPRB participated in the workshops. English language was the primary language, which was utilised during instrument development and later translated in Bangla for field use. The internal validity was checked through back-translation to English from Bangla. Instruments were finalized after field testing.

*Instruments for assessing hospital infrastructures:* Observation checklists were developed by emphasizing the country, socio-economic and cultural context, and hospital resources including human resources and hospital capacity including patient load. The instruments used for assessing the quality of infrastructures contained various components described in table 7. Each component consisted of different items and sub-items.
Table 7: Major areas of assessment of quality of infrastructures

<table>
<thead>
<tr>
<th>No</th>
<th>Areas of Assessment</th>
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<tbody>
<tr>
<td>1</td>
<td>HR</td>
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<td>2</td>
<td>Infrastructure</td>
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<tr>
<td></td>
<td>Physical infrastructure</td>
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<td></td>
<td>Laboratory diagnostic services</td>
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<tr>
<td>3</td>
<td>Infection prevention</td>
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<td></td>
<td>Cleanliness</td>
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<tr>
<td></td>
<td>Waste management system</td>
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<tr>
<td>4</td>
<td>Equip/logistics/supply</td>
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<tr>
<td></td>
<td>Equipment/logistics/supply in ANC and PNC Room in OPD</td>
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<tr>
<td></td>
<td>Equipment/logistics/supply in Newborn Room (OPD)</td>
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<tr>
<td></td>
<td>Equipment/logistics/supply in Labour/Delivery Room</td>
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<tr>
<td></td>
<td>Equipment/logistics/supply in Maternity Ward</td>
</tr>
<tr>
<td></td>
<td>Equipment/logistics/supply in Operation Theatre (OT) Complex</td>
</tr>
<tr>
<td></td>
<td>Equipment/logistics/supply in Newborn Ward</td>
</tr>
<tr>
<td>5</td>
<td>Essential drugs</td>
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<tr>
<td></td>
<td>Essential and Emergency drugs for maternal care</td>
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<tr>
<td></td>
<td>Essential and emergency drugs for newborn care</td>
</tr>
<tr>
<td>6</td>
<td>Record keeping</td>
</tr>
<tr>
<td></td>
<td>Completeness of pt. file in Maternity Ward</td>
</tr>
<tr>
<td></td>
<td>Completeness of pt. file in Newborn Ward</td>
</tr>
</tbody>
</table>

**Instrument to assess the clinical care performance of the HCPs:**
Different types of observation checklists were developed to assess the clinical care performance of the HCPs during ANC, PNC, birth and newborn care. Similar to the instrument utilizing for assessing the quality of infrastructures the checklists for performance assessment had major areas of activities and sub-activities. This observation checklist was a “must do” check list. In other words, healthcare providers should accomplish all activities along with its sub-activities listed in the check list which is provided over-leaf (table 8).
**Table 8:** Areas and activities where *the clinical care performance of the HCPs assessed*

<table>
<thead>
<tr>
<th>Components</th>
<th>Activities</th>
</tr>
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<tbody>
<tr>
<td><strong>Antenatal care</strong></td>
<td>1. General</td>
</tr>
<tr>
<td></td>
<td>2. History taking</td>
</tr>
<tr>
<td></td>
<td>3. Clinical Examination</td>
</tr>
<tr>
<td></td>
<td>4. Care provision</td>
</tr>
<tr>
<td></td>
<td>5. Record keeping</td>
</tr>
<tr>
<td><strong>Postnatal care</strong></td>
<td>1. General</td>
</tr>
<tr>
<td></td>
<td>2. Newborn history</td>
</tr>
<tr>
<td></td>
<td>3. Newborn assessment</td>
</tr>
<tr>
<td></td>
<td>4. Care provision</td>
</tr>
<tr>
<td></td>
<td>5. Record keeping</td>
</tr>
<tr>
<td><strong>Delivery care</strong></td>
<td>1. General</td>
</tr>
<tr>
<td></td>
<td>2. Care during birth</td>
</tr>
<tr>
<td></td>
<td>3. Immediate newborn care</td>
</tr>
<tr>
<td></td>
<td>4. Active management of the third stage of delivery</td>
</tr>
<tr>
<td></td>
<td>5. Immediate postpartum evaluation and care</td>
</tr>
<tr>
<td></td>
<td>6. Infection prevention after birth (if applicable)</td>
</tr>
<tr>
<td></td>
<td>7. Recordkeeping</td>
</tr>
<tr>
<td><strong>Newborn care</strong></td>
<td>1. Management of newborn asphyxia</td>
</tr>
<tr>
<td></td>
<td>2. Management of low birth weight (LBW) neonates</td>
</tr>
<tr>
<td></td>
<td>3. Feeding for stable LBW newborn (wt&gt;1800 gm, &gt;34 week)</td>
</tr>
<tr>
<td></td>
<td>4. Prevention of infection</td>
</tr>
<tr>
<td></td>
<td>5. Management of newborn sepsis</td>
</tr>
</tbody>
</table>
Data collection techniques
Teams comprised of one gynaecologist and one paediatrician collected the data. Four teams were involved in the data-collection process and they received three days of training from the investigators before they started data collection. The teams visited each hospital to collect relevant data.

Photo 2 & 3: During observation of infection prevention system of a sub-district level hospital of Thakurgaon

First, they collected data on infrastructure using the observation checklists. They observed the selected areas and reviewed the necessary documents. The instruments used for assessing the quality of infrastructures contained

Photo 4: Observation is conducted to assess the clinical performance of HCPs, ANC in district level hospital, Jamalpur
various components and each component consisted of different items and sub-items. The researchers put score against each sub-items of each areas as per the direction.

To assess the clinical performance of the HCPs, the team visited all four selected MNH areas of the hospital. They observed the HCPs activities by following the observation checklist. During these activities the researchers played role of non-participating observer and assessed their performance. Altogether 224 cases were assessed from 14 hospitals.

Analysis
Quantitative approaches were utilised and descriptive analysis was performed to analyse the data. The instruments used for assessing the quality of infrastructures and clinical care performance contained various components and each component consisted of different items and sub-items. The average of the sub-items of each item was calculated and then the mean average of the items were calculated and expressed in percentage. For these the data were entered into Epi-Info (Centres for Disease Control and Prevention, Atlanta, GA) and analysed by both Epi-Info and SPSS (version 17; SPSS Inc, Chicago, IL). Frequency distribution was calculated.

4.2.3 Paper III: “Model QI System” for MNH services

Study design
Series of workshops and documents review were the methods utilised in the process of development of the “Model QI System” for MNH care in district and sub-district level hospitals of Bangladesh.

The “Model QI System” including its implementation framework, guidelines and tools were developed through a-five step process as follows:

1. Reviewing of evidence based literature and country experience including base line QI survey report;
2. Drafting framework and implementation process through consultative process including national professional experts;
3. Field testing the model (framework and implementation process, its guidelines and tools/checklists) and workshops at district and sub-district level;
4. Updating of the model and tools based on feedback from districts/sub-districts;
5. Reviewing and final updating the model and tools by national level stakeholders and professional experts at national level workshops and approval by Directorate General of Health Services (DGHS) for piloting in two districts.

Study duration
The study was conducted from May 2012 to October 2012

Study participants
The national level workshop participants were the CIPRB researchers, national professionals related to MNH services (paediatricians, gynaecologists and anaesthesiologist), the health programmers of the Directorate General of Health Services and Directorate General of Family Planning, Bangladesh. At field level, top health managers, doctors and nurses attended the workshops.

Process of development of “Model QI System”

Step 1: Reviewing of evidence based literature, country experience and base line QI survey report
The researchers identified relevant documents and articles from journals through electronic search to review evidence base literature related to quality improvement of health services of developed and developing countries. They also contacted with the relevant government and non-government health officials to collect various gray literatures and documents where the experiences on quality improvement of health services of Bangladesh described. The base line survey report titled “Baseline assessment for introducing quality improvement system in MNH services in facilities of Thakurgaon and Jamalpur districts of Bangladesh” which was conducted by the Centre for Injury Prevention and Research, Bangladesh (CIPRB) was also used. All this information was recorded in a pre-designed review document. The document was then provided to the national workshop participants, who were experts on the relevant field, prior to workshop. Each participant was instructed to identify the components of QI systems and its implementation framework. They also requested to identify the principles and standards for implementation of the QI system through its framework.
Step 2: Drafting framework and implementation process through consultative process participated by national experts

Through series of workshops by utilizing the findings from the review documents and considering the country context, socio-economic and cultural context of the service recipients, availability of resources including service providers, capacity of the hospitals and patient load the workshop participants drafted the Model QI System including implementation framework and its implementation process including guidelines and tools/checklists. Each workshop progressed based on the decision of the previous workshop.

Step 3: Field testing of the model including framework and implementation process, its guidelines and tools/checklists at district and sub-district hospitals

The researchers shared the draft model and the implementation process with the local health managers and health care providers including consultants, medical officers, nursing in-charge and ward masters related to MNH care services of the 14 selected hospitals in Thakurgaon and Jamalpur districts where the baseline survey was conducted\(^9\). After sharing the draft QI system, the field-testing was conducted in two district and four sub-district level hospitals of the surveyed areas to assess the feasibility, acceptability and sustainability of the QI system.

Step 4: Updating the model and tool, based on feedback from districts/sub-districts

The researchers updated all the components of the QI system including its implementation framework, guidelines and tools by incorporating the findings and feedbacks received from the field level managers and health care providers during field testing.

Step 5: Reviewing and updating the model and tools by national level stakeholders and professional experts at national level workshops and finalising it

Approval of the model and the tools by DGHS for piloting areas needed adjustment, and the national level workshop participants and the researchers did modifications.
The developed field tested QI system were finalized at a national level consensus meeting with a high-level technical committee comprised of academicians, programme personnel from Directorate General of Health Services and Directorate General of Family Planning, Bangladesh, representatives from professional bodies, subject specialists, representatives from UN agencies and researchers from CIPRB. The Directorate General of Health Services, Bangladesh approved the QI system to pilot in 14 district and sub-district public hospitals of Thakurgaon and Jamalpur district where the base line survey was done to assess the quality of MNH services of hospitals in 2011.

Analysis
Through a comprehensive documents review followed by a reproducible stepwise process we selected articles comprised with theories, models and intervention programmes related to quality improvement of hospitals. A narrative analysis process was utilised to scrutinize the articles. Qualitative research technique namely content analysis was adopted to generate the common themes for these review articles. The next stage of the analysis method was to segregate the major themes in sub-themes. To address the objective of the III paper the themes and sub-themes were re-checked and after removing the unrelated content the themes and sub-themes were finalized as result through thematic analysis, which were utilised during development of “Model QI System”.

4.2.4 Paper IV: Evaluation of “Model QI System"

Study design
This was an intervention study. An adapted “Model QI System” was piloted in district and sub-district level public hospitals to improve the quality of MNH care services. Both quantitative and qualitative methods were deployed to evaluate the acceptability and feasibility of the QI system. FGDs and IDIs were deployed as a part of qualitative method. Photography was also utilised as a method of qualitative data collection. Quantitative methods included observation and exit interviews.

Study duration
The “Model QI System” was piloted between June 2013 and May 2014.
Study settings and study population
Study settings of piloting the “Model QI System” were the same as the settings where the first phase of the study was conducted. These were the two district hospitals, two maternal and child welfare centres and ten upazila health complexes of two districts namely Thakurgaon and Jamalpur (table 8).

Study participants
The list of participants is given in table 9.

Table 9: List of participants by types of data collection methods

<table>
<thead>
<tr>
<th>Methods &amp; numbers</th>
<th>Participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure observation</td>
<td>All 14 hospitals</td>
</tr>
</tbody>
</table>
| FGDs: 14 (One group from each hospital) | From District Hospitals: civil surgeon, obstetrics and paediatrics consultants, anaesthesiologist, nursing superintendent, and two senior staff nurses  
From MCWCs: deputy director of family planning, anaesthesiologist, medical officer, one nurse, and one family welfare visitor  
From UHCs: upazila health and family planning officer, obstetrics and gynaecology specialists, paediatrician, anaesthesiologist, resident medical officer, and one nurse |
| IDIs: 56 (four interviews from each hospital) | From District Hospitals, MCWCs, and UHCs: One laboratory technician/pharmacist, one ward master/nursing supervisor, one ancillary staff from the maternal or neonatal wards, and one cleaner |
| Exit interviews: 224 (from each hospital: 8 before and 8 after intervention) | Patients or their attendants from Maternal, Labour, and Newborn Wards at District Hospitals, MCWCs, and UHCs who received care at least three days before discharge from the hospitals |
| Photography                      | Infrastructures of selected hospitals                                                                                                       |
Research instruments
All types of instruments utilised in the study were developed through workshops attended by the researchers of CIPRB, obstetricians, paediatricians, and programme personnel from the Bangladesh Ministry of Health and Family Welfare related to MNH services. Both the structured and semi-structured questionnaires were first developed in English and later translated into Bangla for the use of the respondents. To check its internal validity, the Bangla version was back translated into English. Before finalizing all types of instruments were pretested in a government hospitals not included in the study.

For pictorial data collection district coordinators of CIPRB visited the hospitals and identified areas of photography. After finalizing the areas of photography, a list was prepared for taking snap shots to obtain pictorial data before, during and after implementation of the model.

**Quantitative:** QI implementation guidelines and different types of tools were utilised which were developed during the QI model development phase (table 10).

<table>
<thead>
<tr>
<th>No</th>
<th>Tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Form for QI-Coordination Committee reporting</td>
</tr>
<tr>
<td>2</td>
<td>Form for QI-Coordination Committee meeting on coordination, programme review and planning</td>
</tr>
<tr>
<td>3</td>
<td>QI-Committee reporting form</td>
</tr>
<tr>
<td>4</td>
<td>QI-Committee planning Form</td>
</tr>
<tr>
<td>5</td>
<td>Form for QI-Committee meeting on coordination, programme review and planning</td>
</tr>
<tr>
<td>6</td>
<td>Tools for exit interviews (patient satisfaction)</td>
</tr>
<tr>
<td>7</td>
<td>Checklist for supervision and monitoring</td>
</tr>
<tr>
<td>8</td>
<td>Checklist for QI clinical coaching</td>
</tr>
<tr>
<td>9</td>
<td>Inventory checklist for essentials drugs and supplies</td>
</tr>
<tr>
<td>10</td>
<td>Task monitoring board</td>
</tr>
<tr>
<td>11</td>
<td>Form for minutes of the monthly meeting</td>
</tr>
<tr>
<td>12</td>
<td>Tools for Monthly QI-Team meeting of Quarterly QI plan &amp; self appraisal</td>
</tr>
</tbody>
</table>
Structured questionnaire with a five-point Likert scale was utilised to conduct the exit interviews. To assess the satisfaction level of the patients we included question on cleanliness of the hospitals, time given by healthcare professionals, way of examination and treatment, quality and cost of treatment, refer the hospital to others to receive treatment and overall services MNH services provided to the patients.

The statements for the Likert scale were constructed based on the issues described in the above mentioned domains. The responses varied through: strongly agree, agree, undecided, disagree, and strongly disagree and scored in a descending order from 5 through 1. The tool contains questionnaires to understand the perceptions of patients who attended the hospitals and received care/services during before and after pilot intervention.

**Qualitative:** In conducting FGDs and IDIs, semi-structured open-ended questions with probes were used to permit the respondents’ liberty to express their understandings about the QI intervention programme. The data collectors asked questions with probes on certain areas namely feasibility, acceptability, sustainability and scalability of the programme.

**Data collection techniques**

**Qualitative:** Teams comprised of three anthropologists collected the data. Four teams were involved in the data-collection process and they received three days of training from the investigators before they conducted FGDs.
and IDIs. The teams visited each hospital to collect relevant data. The interviews were audio taped and handwritten notes were made. In each type of session, a facilitator requested one of the participants to express his/her experiences and views about the pilot QI programme. This was an ice-breaking exercise as well as a thought-provoking mechanism for the participants. The facilitator then gradually introduced a series of prompts to encourage discussion about their perception on feasibility, acceptability, sustainability and scalability of the programme. The FGDs continued 120-150 minutes each and for IDIs the researchers took 30 to 40 minutes to complete one. Every interview was audio recorded and interview notes were taken. The anthropologists accomplished 14 FGDs and 56 IDIs to address the objectives of the study.

**Quantitative:** Trained teams consisting of two data collectors with social science background collected the data. Four teams were involved in the data-collection process for each time (before and after piloting the QI programme). Before data collection all research officers received an extensive three days training by the CIPRB researchers. The teams visited each hospital and interviewed the patients or their attendants who were discharged but till present within the hospital premises. A total of 224 exit interviews were conducted, with sixteen from each hospital (8 interviews before and eight interviews after the QI programme).

**Photography:** A professional photographer trained both the district coordinators of CIPRB of Thakurgaon and Jamalpur districts how to take photos. Images taken by the district coordinators were considered as pictorial data. The subjects of the images remained same before and during piloting the “Model QI System”.

**Analysis**
In this study we utilised both quantitative and qualitative approaches to obtain necessary data.

**Quantitative data analysis:** To analyse the tools utilised during the intervention period we performed descriptive analysis. The data were entered into Epi-Info (Centres for Disease Control and Prevention, Atlanta, GA) and analysed by both Epi-Info and SPSS (version 17; SPSS Inc, Chicago, IL). The mean score was calculated to measure the changes in the different MNH service points. To assess the satisfaction level of the patients or their
attendants exit interviews were conducted utilising a five-point Likert scale. The statements for the Likert scale were constructed based on the following issues: cleanliness of the hospital, time given by healthcare professionals, way of examination and treatment, quality and cost of treatment, refer the hospital to others to receive treatment and overall services MNH services provided to the patients. The responses varied through: strongly agree, agree, undecided, disagree, and strongly disagree and scored in a descending order from 5 through 1. The tool contains questionnaires to understand the perceptions of patients who attended the hospitals and received care/services during before and after pilot intervention. The level of patients satisfaction was determined by calculating the mean score of the five-point Likert scale.

**Qualitative data analysis:** Anthropologists who conducted the FGDs and IDIs transcribed each of the recorded interviews and the researchers compared the data for accuracy. Primarily transcription was made in Bangla and subsequently translated into English. At this moment a meeting was conducted among the researchers and the data collectors to finalize the English transcription. Here every difference and exceptions were addressed by repeated checking of the entire data from the beginning to the end. We developed a checklist matrix where meaning of text were emphasised and considering this matrix we coded and categorised the data. Themes and sub-themes were identified from this matrix. Under each theme and sub-theme, every response were piled and then the similarities and dissimilarities were identified and compiled in general statements. To interpret the qualitative data, we performed thematic analysis. After sorting and categorizing the responses, excerpts from the transcripts were chosen to illustrate the summary statements, which were used to validate the findings.

Pictorial data were analysed by adopting content analysis to swot up visual text. We tried to explore the meaning of the visual text through eye tracking. An arrow indicated the emphasised areas. Images were taken before and after piloting the “Model QI System” to assess whether any type of changes occurred due to the intervention programme. The areas of pictorial data collection were related to cleanliness, availability of logistics and supplies, privacy maintenance, availability of signage and behaviour change communication (BCC) material and ensuring 3s (sort-set-shine) of the subject.
4.3 Ethical considerations

Ethical Review Committee of the Centre for Injury Prevention and Research, Bangladesh (CIPRB) approved all three phases of the research including the methodology. The Directorate General of Health Services and Directorate General of Family Planning of Ministry of Health and Family Welfare, Bangladesh provided written permission to conduct the study in the aforementioned hospitals. Informed written consent was obtained from the authorities of each hospital, the HCPs, the patients and the attendants of the patients who participated in the studies. All types of written consents were obtained after explaining to the participants about the purpose of the study and the importance of their views as service providers and patients. Before taking images written consent were taken from the related hospital authority. For privacy and confidentiality of information, the study participants were reassured that all information received would remain anonymous and the collected data would be used for this research only. They were also informed that their participation would be voluntary and they could withdraw from the interview at any point. Hard copies of the collected data were kept in a secured place. The interviewers and investigators had access to the audiotape data. The electronic databases were secured by setting a password and were limited to the investigators and the data manager involved in these studies. All photos are reproduced in the thesis with due permission from the respective participants.
5 Summary of results

Paper I: HCPs’ and patients’ perception on quality of care

The objectives of the paper was to explore the perception of healthcare providers regarding the quality of MNH care and to investigate patients’ satisfaction with the MNH care received from the district and sub-district hospitals in Bangladesh. In this study, it was revealed the quality of MNH care is poor in district and sub-district hospitals in Bangladesh.

Through GDs and IDIs with the health managers, health care providers and support staff it was revealed that the main issues affecting the quality of health care services provided to the patients were: i) shortage of personnel, workload, and overcrowding; ii) inadequate logistics and laboratory support; iii) under use of patient-management protocols; iv) lack of training and v) insufficient supervision. Study findings showed that the healthcare providers from all the hospitals were willing to participate in a quality improvement process if it really helps them to improve their working environment. The healthcare providers suggested that the QI issues should be discussed at a national level and solutions should come from there. In both GDs and IDIs, the respondents reported that training should be organized for all types of healthcare providers to help them maintain a standard of quality healthcare services. In addition, many participants proposed that extra incentives should be offered to the healthcare providers to motivate them to improve their quality of care. They also suggested that there should be a body, including service providers, nongovernmental organization partners, and political parties, responsible for the monitoring and supervision of all types of facility activities to ensure the quality of care.

Clients’ perception of satisfaction were judged in six areas: 1) waiting time to receive care from healthcare providers after entering the hospital; 2) cleanliness of the hospital; 3) adequate time given by the healthcare providers; 4) the opportunity to ask the healthcare providers questions about their care; 5) satisfaction with the drugs received from the hospitals; and 6) satisfaction with the MNH services received from the hospital.

From the exit interviews, it was revealed that the average mean waiting time before being seen by a healthcare provider was 10.95, 9.67, and 4.79
minutes at district hospitals, maternal and child welfare centres and upazila health complexes respectively.

The proportion of respondents who were satisfied with the cleanliness of the hospital was higher at upazila health complexes (82.5%) than at district hospitals and maternal and child welfare centres (50.0% and 43.7%, respectively). Majority of the respondents who received MNH services from district hospitals were satisfied with drugs dispensing (75.0%), however, this proportion is low both in maternal and child welfare centres and upazila health complexes (25.0% and 56.2% respectively. Very less proportion of respondents of all three types of hospitals were satisfied when they were asked regarding the opportunity to ask questions to the HCPs. However, Majority of the respondents who received MNH services from District Hospitals, Maternal and Child Welfare Centres and Upazila Health Complexes were satisfied with given time by the HCPs, as well as satisfied with the MNH services they received (table 11).

Table 11: Distribution of clients who were satisfied in different domains of hospital healthcare in the selected hospitals

<table>
<thead>
<tr>
<th>Area of satisfaction</th>
<th>Respondents by type of healthcare facilities</th>
<th>(N=112)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>*DHs (n=16)</td>
<td>**MCWCs (n=16)</td>
</tr>
<tr>
<td>Satisfied with cleanliness</td>
<td>8 (50.0)</td>
<td>7 (43.7)</td>
</tr>
<tr>
<td>Received drugs</td>
<td>12 (75.0)</td>
<td>4 (25.0)</td>
</tr>
<tr>
<td>Adequate time given by physician</td>
<td>12 (75.0)</td>
<td>13 (81.2)</td>
</tr>
<tr>
<td>Opportunity to ask questions</td>
<td>5 (31.0)</td>
<td>1 (6.2)</td>
</tr>
<tr>
<td>Satisfied with MNH services received</td>
<td>14 (87.5)</td>
<td>15 (93.7)</td>
</tr>
</tbody>
</table>

*District Hospitals, **Maternal and Child Welfare Centres, ***Upazila Health Complexes

In conclusion, we can say that the HCPs were dissatisfied with the quality of care they provided to the patients; however, majority of their patients were satisfied with the MNH services of the hospitals.
**Paper II: Infrastructure and clinical care performance assessment**

**Assessing of quality of infrastructures**

In this study quality of infrastructures were assessed through six components namely human resources, infrastructures, infection prevention systems, equipment/logistics/supplies, essential drugs and record keeping. The quality of infrastructures were assessed in this study, we considered 60% and above as the cut off point for labelling the status as satisfactory.

![Figure 9: Distribution of average mean of components of infrastructures by types of hospitals](image_url)

Through this study it was revealed that human resource status was in satisfactory level in District Hospitals and Maternal and Child welfare Centres (72.7% and 100.0% respectively), however, Upazila Health Complexes scored only 45.6%. Human resource component was evaluated on the basis of the actual number of available doctors and nurses against the sanctioned posts. Although infrastructural set up as assessed in district hospitals and upazila health complexes in both Jamalpur and Thakurgaon districts remain satisfied (85.2% and 64.6% respectively), however, the status of infection prevention systems was found below cut off value in both types of hospitals (27.4% and 41.9% respectively). The status of
equipment/logistics/supplies was found poor both in maternal and child welfare centres and upazila health complexes (50.9% and 51.1%). All three types of hospital obtained below cut off point in having essential drugs and record keeping systems (ranging from 39.0% to 51.5% and 23.7% to 34.5%). When the average mean of all the surveyed components was calculated, all three types of hospitals scored below cut off point (ranging from 45.9% to 57.1%) and the quality of the infrastructures were considered as not in satisfactory level (figure 9).

Assessment of clinical care performance of the HCPs during MNH services at hospitals

The clinical care performance of the HCPs namely doctors, senior nurses and family welfare visitors were assessed when they provided MNH services including antenatal, postnatal, delivery and newborn care. As per the observation checklists utilised in this study, each HCP should accomplish all the activities including their sub-activities correctly and scored 100% in all activities of the check lists.

![Figure 10: Distribution of average mean of components of infrastructures by types of hospitals](image)

![Figure 10: Distribution of average mean of level of clinical care performance by types of hospitals](image)

The clinical care performance of the health care providers was found almost the same in types of surveyed hospitals ranging from 73.9% to 74.3%). However, they did not perform all the activities as per the must do check lists.
Paper III: “Model QI System” for MNH services

Through documents review, baseline survey and series of workshops an adapted “Model QI System” was developed for improvement of MNH services of the district and sub-district level hospitals of Bangladesh. The workshop participants and national consensus meeting members conceived the model considering the continuous capacity-building based on concept of six building blocks of a health system described by WHO which included i) service delivery, ii) health workforce, iii) information, iv) medical products, vaccines and technologies, v) financing and vi) leadership and governance. According to WHO building blocks, health system works for quality improvement through building facility readiness, and providers’ skill improvement, and coordinated actions. Based on the WHO building blocks concept the following key components by area of work for quality improvement in MNH services in a hospital were considered:

i) Health system support which included:
   - Infrastructure
   - Infection prevention and waste management
   - Equipment and supplies
   - Pharmacy, drug Store; and essential and emergency drugs
   - Laboratory and diagnostics
   - Administrative; information- management

ii) Clinical service delivery which included:
   - Antenatal care,
   - Intra-partum care,
   - Post-partum care and
   - Newborn care
   - Emergency Obstetric care
   - Family planning services
   - Post abortion care
   - Blood transfusion

iii) Inter-department/agency coordination which included:
   - Collaboration between DGHS, DGFP, BNC and DNS
   - Collaboration with UN organizations, medical institutes & NGOs
iv) Utilization of services & client satisfaction which included:
- Client flow in quarterly basis
- Exit interview result: client referral by satisfied client

The adapted “Model QI System” consists of three elements, which would help to implement the model in the district and sub-district level hospitals of Bangladesh. The elements included:

i) QI implementation framework;
ii) QI implementation guidelines;
iii) Tools for QI framework implementation.

i) QI implementation framework
A QI implementation framework was developed, shared agreed through series of workshops at national and sub-national level. For effective implementation of QI process, one QI Committee per facility and necessary numbers of QI Teams by key area of MNH care were identified with defined composition, roles–responsibilities and functions. One QI Coordination Committee was also structured per district to supervise, guide and monitor QI activities in all facilities under the specified district.

Partnership would establish with peripheral medical institutes/medical colleges or professional organizations to support technical supervision and monitoring (through technical committee). To depict progress, gaps and challenges in service delivery in regards to health system support, human resource management, ensuring evidence based clinical practices; a vertical supportive supervision and monitoring system (through internal and external monitoring team) and would be integrated within the QI implementation system. The framework is illustrated over-leaf (figure 11).
ii) QI implementation guideline

The QI guideline included a clear description of the roles and responsibilities of each teams and members. The QI teams of different levels would work by following the agreed principles which was developed on the basis of our social, cultural, availability of human and nonhuman resources and policy directions contexts. Implementation followed few basic principles which are given over-leaf (table 12). During implementation, the district level QI-Coordination Committee would act as the central body for coordination and control of the QI-system. This committee would be convened by the Civil Surgeon and Co-Chaired by Deputy Director of Family Planning of each district. The health managers of the district and sub-district level hospitals would be the members of the committee. Below the QI-Coordination Committee, each facility would have a QI Committee and several quality improvement teams for MNH services.

Each QI committee would be chaired by the top hospital manager and consultants would be the members of the committee. On the other hand each QI Team would be formed of doctors, nurse-midwives, support staff working in specific area and focal person would be the Nurse in-charge of

Figure 11: The implementation framework of “Model QI System”

QICC – Quality Improvement Coordination Committee; DH –QIC-Quality Improvement Committee at District Hospital; MCWC– QIC-Quality Improvement Committee at Maternal and Child Welfare Centre; UHC – QIC-Quality Improvement Committee at Upazila Health Complex, QIT– Quality Improvement Team
the respective ward in most of the cases which are usually agreed by the team.

QI Teams would be the basic unit of QI-system and perform all related activities while QI Committees would monitor and supervise the functions of QI Teams. The uniqueness of these QI Teams was presence of nurses as focal person to lead all activities. QI Teams followed a problem solving participatory approach namely PDCA cycle for continued quality improvement the Area. 5S concept (Sort-Set-Shine-Standardize-Sustain) of QI process would be utilised in improving work environment.

**Table 12: Key Principles for implementation of “Model QI System”**

<table>
<thead>
<tr>
<th>Key principles</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<tr>
<td>2</td>
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<tr>
<td>3</td>
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<td>4</td>
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<td>5</td>
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<td>6</td>
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<td>7</td>
</tr>
</tbody>
</table>

**iii) Tools/forms for QI framework implementation and the mechanisms of its utilization**

Different types of tools were developed for QI Teams, QI Committees, QI-Coordination Committee, Technical Committee and External and Internal Supervision and Monitoring Committee and tools for assessment of client satisfaction which would be utilised by following the QI implementation guidelines. The whole process of implementing QI system by utilizing the developed tools would follow an evidence based participatory problem-solving mechanism leading to the final stage of total quality management (5S-KAIZEN-TQM) under stewardship and guidance of the top management.

As the basic unit of this QI system would be QI-Teams, the implementation process would start from this level. According to the developed guidelines the QI Team members would utilize the tools by following a definite
process to operate in cyclic order following Plan, Do, Check and Act (PDCA) method. The members of this team would sit for routine monthly meeting with set agendas and would go for specific decisions to be accomplished within time frame. The process of planning and re-planning would be facilitated by QI Committee, QI-Coordination Committee and CIPRB technical persons.

The QI Committee of hospitals would supervise all activities under QI implementation process and would remain reportable to District QI-Coordination Committee. Once in a quarter the QI Committee would organize a QI coordination, planning and progress review meeting based on problems noticed by QITs to identify ways out. This committee would take administrative actions needed for QI activities and provide necessary feedback and guidance to QI teams of the hospitals.

Each level would use specified reporting form. Tools for supervision and monitoring for different tier were developed in such a way that supervision would continue with supportive type character, while monitoring system would function to illustrate progress, gaps and challenges in service delivery in regards to health system support, human resource management, ensuring that the evidence based clinical practices would be applied during clinical care.

**Paper: IV Evaluation of “Model QI System” for MNH services**

The “Model QI System” was piloted in 14 district and sub-district level hospitals in Thakurgaon and Jamalpur districts of Bangladesh.

**Process evaluation of the “Model QI System” implementation programme**

The processes of one year of implementation of “Model QI System” were evaluated by using quantitative and qualitative methods. During the intervention programme, all the proposed committees namely QI-Team, QI-Committee and QI-Coordination Committee were developed. Throughout the QI intervention programme QI-Committees of all three types of hospitals conducted 100% meetings, however, QI-Teams and QI-Coordination Committees conducted 92% and 83% meetings respectively.
The QI-Teams identified and prioritised six major areas of QI improvement namely i) environment and structures; ii) infection prevention and waste management; iii) health education and behaviour change communication (BCC); vi) logistics, drugs and equipment; v) documentation and vi) standard health care/services, of care of quality improvement of which could be improved. Each major area was comprised of a few issues.

The QI Teams had implemented over 80% of the decisions regarding documentations and health education/behaviour change communication (BCC). They also executed over 72.0% decisions related to environment; and infection prevention and waste management. However, they could execute only 39.9% decisions regarding logistics, drugs and equipment.

The external and internal monitoring teams assessed all hospitals by four areas of quality improvement namely infrastructure and environment, cleanliness and infection prevention, supplies, drugs and equipment, and clinical services utilising a QI monitoring tool before and at the end of the QI intervention.

![Figure 12: Changes in the major areas of quality improvement after intervention](image-url)
The figure 12 shows the aggregate score of all the areas of quality improvement of 14 hospitals. For each area of quality improvement there were certain scores. The mean score was calculated before and after intervention. Positive changes were observed in all the selected areas of MNH care related services. Total score for infrastructure and environment was 10 and the mean scores were 6.5 and 8.6 before and after intervention respectively, i.e. there was 25.0% improvement. Similarly, improvement was achieved in cleanliness and infection prevention (36.4%), supplies, drugs and equipment (19.7) and clinical services (5.1%)

**Patient satisfaction**

Exit interviews were conducted with in-patients (or the attendants of the newborn) who received MNH services at least three days before discharged. The data was collected before and after intervention programme.

![Figure 13: Distribution of respondents by the level of satisfaction on cleanliness of the hospitals](image)

A positive improvement on patient satisfaction on cleanliness of the hospitals was observed at the end of the intervention programme. Although, the satisfaction level was found very low on toilet cleanliness even after QI intervention (30.3%), however, satisfaction level on cleanliness of bed and
overall cleanliness on MNH service points were found significantly improved (p=0.001 and p=0.02 respectively).

![Graph: Distribution of respondents by the level of satisfaction on cleanliness of the hospitals](image)

**Figure 14:** Distribution of respondents by the level of satisfaction on cleanliness of the hospitals

Although the satisfaction level of the respondents on the services provided by the health care providers was high both before and after QI programme implementation. However, satisfaction level on overall MNH services was declined a little from 77.7% to 74.5% after piloting the “Model QI System” which was statistically not significant (p=0.6). The level of satisfaction on the way treated by the doctors was improved significantly (p<0.001). Before intervention of the QI programme, only 55.4% respondents told that they would refer the hospital to the others, however, after intervention this proportion was increased significantly (p<0.001).
Qualitative result of evaluation of acceptability and feasibility of the “Model QI System” by the health care providers

The qualitative approaches were utilised to evaluate the “Model QI System” in terms of feasibility and acceptability. According to the health managers, health care providers and hospital support staff the system was found acceptable to them and feasible to implement.

Acceptability of the “Model QI System”

The quality improvement programme was welcomed and appreciated by almost all the health managers, health care providers and hospital support staff of the study hospitals. Majority of them opined that the QI programme was a very effective programme and if the program could continue for long period of time major changes could be observed. Health managers, participants of FGDs, recommended that this programme should be scaled-up in all government hospitals. They added that health care providers and the support staff engaged themselves enthusiastically in the monthly meetings to make a change in the quality of care.

Civil Surgeon of Jamalpur district said,

“I was a little bit doubtful about the success of the QI programme when the intervention started. Over time I noticed that health care providers and staff related to the implementation of the programme were being aware and serious about their responsibilities. They enthusiastically attended meetings related to this programme”.

The health care providers expressed that before introducing the programme, to some extent, they were reluctant about their responsibilities on improving clinical and technical aspects of quality of MNH care. They considered this programme as a breakthrough for enhancing staff awareness on quality services in the government hospitals.

One of the medical officer of Jamalpur District hospital stated,

“We worked day and night, however, quality was not in our concern. Quality improvement programme made us aware about the importance of quality services and we learnt to find out the ways to improve the certain areas related to MNH service points. At the present we are capable to provide the best
services to our clients and make them satisfied with MNH services even with the limited available resources”.

The health care provides stated that they were providing health education programme and conducting clinical and death review meetings regularly after initiation of the intervention programme. The health care providers reported that the standard protocols for clinical care were in use as suggested in the Model QI System. They also mentioned that emphasis had been given to improve the cleanliness and infection prevention of the various MNH service points. They reported that the relationship of the providers and the patients had also improved.

Almost all the respondents of IDIs expressed that they felt honoured and respected when they sit together with their superiors in QI meetings and got chances to provide their opinion regarding Quality related issues.

One of the cleaner of an Upazila Health Complexes of Thakurgaon district stated,

“During monthly QI meetings sir (upazila health and family planning officer) always asked me how to improve the cleanliness of the hospitals. I felt good. I think this type of meeting is good to make better relationships with the health care providers and staff”.

Feasibility of the “Model QI System”
In the FGDs the health managers and health care providers expressed that the “Model QI System” was feasible to implement, as it was designed in such a way that it utilised the existing health system and implemented with the existing resources. However, it needed time to get adapted fully into routine health systems functionaries.

One gynaecologist stated,

“The guidelines and tools developed by CIPRB were very helpful and effective because of simplicity of those materials. However, one year duration for implementation this programme was not enough. More time is needed to own the programme by the staff”.

All most all the participants of both FGDs and IDIs mentioned that improving quality was not a easy task, especially when time and resource were limited.

One IDI respondent from Maternal and Child Welfare centre of Thakurgaon district said, 

“Quality has been changing gradually. People needs time to be motivated. After initiation of the QI programme we introduced a system to taking off the shoes before entering the operation, post operation and delivery areas. At the end of the intervention programme, e noticed that people were following our instruction even when we were not available there”.

The FGDs participants emphasized that the bottom approach of the model played a key role for the success of the pilot program. In this model the nurses and other support as QI-Team members performed active role to identify the gaps and prioritize the issues where improvement were needed. However, the respondents reported that a constant supervision and monitoring from the government was essential.
Pictorial result

Through converting the images to text, it was revealed that visible changes were present in terms of cleanliness, infection prevention systems, supplies/logistics/equipment, as well as supervision and monitoring.

**Ensured cleanliness**

Photo 7-8: QI-Team of Emergency department, upazila health complex of Jamalpur took decision to clean the basin in first month of piloting the “Model QI system” and within few days they made it

Photo 9-10: QI-Team of Outpatient department of District Hospital, Thakurgaon decided to clean the wall and cleaned it
Photo 11-12: QI-Team of Emergency department of District Hospital, Thakurgaon decided to repair and clean the basin to make it usable and did it.

Photo 13-14: QI- Team of Maternal ward of an upazila health complex of Jamalpur

Ensured privacy of the patients

Photo 15-16: QI- Team of Emergency department of District Hospital, Thakurgaon decided to repair and clean the basin to make it usable and did it.
Photo 17-18: QI- Team of Labour room for maternal and child welfare centre, Thakurgaon took decision to ensure privacy with screen between the labour tables and ensured privacy.

Photo 19-20: QI- Team of Labor ward, District Hospital, Thakurgaon created demand for door to ensure privacy in labour room.

Ensure supplies/logistics/equipments

Photo 21-22: QI-Team of Labor ward, District Hospital, Thakurgaon created demand for door to ensure privacy in labour room.
Photo 23-24: QI - Team of Labor room of an upazila health complex, Thakurgaon created demand for basin to ensure hand washing

Photo 25-26: QI - Team of Operation Theatre of maternal and child welfare centre, Thakurgaon created demand for rack to keep medicine and the authority provided it

Photo 27-28: QI Team of Labor room of maternal and child welfare centre, Jamalpur created demand for focus light to provide quality
Photo 29-30: QI Team of Emergency department of an upazila health complex, Thakurgaon created demand for focus light to ensure quality

Photo 31-32: QI Team of Labor room of maternal and child welfare centre, Thakurgaon decided to ensure hand washing following protocol

Photo 33-34: QI Team of Labor room of maternal and child welfare centre, Thakurgaon decided to ensure 3-coloured bin for proper waste disposal and ensured it
**Practiced of 3s (Sort-Set-Shine)**

*Photo 35-36: QI -Team of Labor room of an upazila health complex, Jamalpur took decision to adopt 3-s in display board and ensured it*

**Ensured Signage and Behaviour Change Communication (BCC) materials**

Before piloting the “Model QI System” in fourteen hospitals, there was no provision to use any signage or BCC materials. The programme introduced the signage to receive the services easily. BCC materials were developed to make the patients aware on health issues. All the signage and BCC materials were developed in Bangla language to make the patient read and understand easily.

*Photo 37-38: Before and after three months of piloting the “Model QI System”*
Photo 39-40: Before and after three months of piloting the “Model QI System”

Photo 41-42: BCC materials were supplied to each hospital during the intervention program
Task monitoring Board (ensured in all the facilities)
This was a kind of tools, which was developed as a part of “Model QI System”. Each QI team utilised one task monitoring board to supervise the status of cleanliness, waste disposal, supplies, equipment and stocks and documentations. Nurse as focal person of a QI-Team was responsible to maintain this task board. At the end of the month, the task monitoring board was evaluated by the whole QI team and was taken necessary actions to enhance the quality of services.

Photo 43-44: Task monitoring board was utilized by each QI-Teams of all fourteen hospitals where the “Model QI system” was piloted
6 Discussion

The overarching objectives of the thesis were to explore the current quality of MNH care to contribute to the development of a QI model system; develop and pilot the model system to evaluate its feasibility and acceptability at district and sub-district level hospitals.

As the ultimate goal of this study was to develop and evaluate a “Model QI System” for its acceptability and feasibility, we tried to address the following questions:

a) How can we explore the need of quality improvement intervention programme including the status of current quality of care, HCPs’ perception about the needs, and patients’ perspective related to satisfaction with services delivered?

b) What will be the areas of work of quality improvement of MNH services?

c) What information will be needed to develop a QI implementation framework?

To address the above mentioned issues, we decided to design our research in three phases which would follow the FADE model of quality improvement (36-38). According to this model first we conducted a base line survey in 14 district and sub-district government hospitals of Thakurgaon and Jamalpur districts in Bangladesh. Through this survey we identified the areas of quality improvement of MNH services and analysed the actual situation of the existing quality of MNH services of those hospitals. In the second phase of the FADE model we developed a QI intervention programme, which was based on the findings of the baseline survey and documents review related to quality improvement of health services. Considering the socio-cultural and economic context of Bangladesh, we developed an adopted “Model QI System” for MNH services. We considered two well known definitions of quality health care namely i) Donabedian quality care definition and ii) definition developed by US Agency for Health Care Research (1-2). Considering the concept of WHO six building blocks of a health system and PDCA cycle along with 5S-KAIIZEN-TQM approach the adopted “Model QI System” including its implementation framework, guidelines and tools were developed (84-85, 39-40, 43-44).
Finally, in third phase we implemented the adopted “Model QI System” and evaluated the acceptability and feasibility of the QI system for MNH care services at district and sub-district level government hospitals in Bangladesh.

6.1 Situation of current quality of MNH care at district and sub-district level government hospitals of Bangladesh

In our first two papers we determined the existent quality of hospitals related to MNH services of district and sub-district level hospitals of Bangladesh. The ultimate goal of assessing the quality of MNH services of the hospitals was to develop and evaluate a quality improvement system and its implementation framework, which could be effective, acceptable and sustainable for a low resource setting like Bangladesh.

Infrastructural set up and basic facilities as assessed in district and sub-district hospitals in both Jamalpur and Thakurgaon districts remain inadequate in providing maternal and newborn care. Logistics, supplies and equipment for MNH services were found inadequate and waste management systems were found to be very poor. Both quantitative and qualitative data that we explored in this study revealed a deficit in human resources, particularly in terms of trained clinical staff and lack of their round-the-clock services remains the main constrains towards providing quality maternal and neonatal care. Cleanliness and infection control demands special and immediate attention. Existing systems of record keeping and clinical documentation were also observed to be inadequately performed. Inadequate supervision also worked as a barrier to provide quality of care.

Consistent with our study findings Hoque et al and Khodeza et al revealed in their studies that the factors which played main role behind the poor quality of MNH services were constrain of resources including skilled human resources and equipment/logistics/supplies, inadequate teamwork, and lack of information and supervision (104-105).

Sameena and colleagues conducted a study in government hospital of Bangladesh and found that the quality of care provided to the mother and newborn were poor and the healthcare providers were not satisfied with services they provided to the patients (20). Similar to our study Mridha
and colleagues revealed that there was scarcity in skilled human resources in emergency obstetric care in hospitals of Bangladesh (106).

In our study clinical performance of the HCPs of MNH services also found poor which was a very common finding revealed from the studies conducting in developed countries like Albania, Turkmenistan, Kazakhstan and Pakistan (107-108). However, the feature is different in developed countries. Shi and colleagues conducted a study in US health facilities and revealed that the performance of the health care providers were up to the mark (109).

Although the quality of care provided by these hospitals was low, however, through exit interviews, patient satisfaction level was found high. Dalal and colleagues conducted a study in India and revealed that the clients of the public hospitals mainly come from poor socioeconomic backgrounds with limited education and are not aware of their health rights. Less-educated people are more satisfied in terms of the healthcare services that they receive (110-111). Although we did not determine any socioeconomic factors by including the education level of the patients in our study, the reason for satisfaction could be the same. In general, the majority of poor people seek care from the public hospitals in Bangladesh (24).

The Government of Bangladesh committed to provide quality health services to all people in the society. Health, Nutrition and Population Sector Programme (HNPSP) of Bangladesh prioritized ensuring universal accessibility and equity in healthcare with particular attention to the rural population (60). Maternal and Child Health (MCH) and reproductive health have already been emphasized in the HNPSP and newborn health has recently become a priority concern. The United Nation (UN) organizations especially WHO, UNICEF and UNFPA provide financial and technical support to the Government for implementing various key programs namely MPDR, MiH and HBB in the hospitals (61-65). However, the utilisation of the hospital services is still poor. Biswas revealed in his studies that low quality of MNH services is played an important role not to use MNH services from government hospitals (61). Study finding conducted by Dalal et al in India also complemented the findings of Biswas (110, 61).
The issues identified through the current baseline study are crucial in strengthening not merely the quality, in some instance the physical presence is necessary to contribute in saving maternal and neonatal lives. The installation of services with required spaces and logistics has to follow an implementation of agreed standard procedure by level of facility as well as category of service areas. Most of the issues are relevant to the administrative and management solution by local initiatives mostly though national level guidance and supportive monitoring is necessary.

However, provider’s perception and staff perception suggested that structured quality improvement system would improve maternal and neonatal care at all facilities through constant monitoring and ensuring total accountability.

6.2 QI model development

Through document reviews, baseline survey and workshops and national consensus meeting an adapted “Model QI System” and its implementation framework, guidelines and tools were developed.

Improving the quality of care of health facilities is a never ending journey. Although it is a subjective, changeable, multifaceted and multidimensional concept, however always depends on time and place. Quality of care of health facilities is one of the most vital issues to reduce maternal and newborn morbidity and mortality of Bangladesh. Although there were challenges to choose the definition of QI appropriate for the Model QI System, however the experts adopted the definition for our model from the following definitions defined by the US Agency for Healthcare Research and Quality: “doing the right thing to the right person at the right time at the lowest cost” and Donabedian’s definition about quality of care “that kind of care which is expected to maximize an inclusive measure of patient welfare, after one has taken account the balance of expected gains and losses that attend the process of care in all its parts” (1-2). Keeping in mind the socio-cultural and economic context of Bangladesh, this QI-MNH system for hospital is developed by modifying those two definitions with PDCA cycle along 5S-KAIZEN-TQM approach with (39-40, 43-44).

The current model would be applied in district and sub-district level hospitals of Bangladesh to improve the quality of MNH care with special atten-
tion to HCPs needs and clients satisfaction. This QI system would work with the following characteristics, which will be the key to success of quality improvement: efficiency, efficacy, effectiveness, equity, accessibility, comprehensiveness and acceptability.

Asian countries like Bangladesh, Laos and Cambodia often fight with inadequate human resources, shortage of supplies along with the inadequate access to necessary medicines and technologies and compromise with quality of care (112-113). However, many of the Asian countries address the quality issues by adopting the 5S-KAIZEN-TQM approaches successfully (114-115). Not only the Asian countries, also African countries experience different types of approaches of QI programmes to improve quality of health facility care (44).

**Strengths of the “Model QI System”**
The model was developed through national consensus involvement of all level of stakeholders. From the very beginning of the model development the development partners provided their supports.

We assessed the clients’ needs and satisfaction level before developing the QI system so that the QI system can address the problems properly. The uniqueness of this model was bottom up approach. The nurses would act as the focal person and thus the nurses empowerment would be ensured during the implementation of the model. Although the model was developed at national level, however, it obtained inputs even from the local level implementers including health care providers and support staff of district and sub-district level hospitals. According to the implementation framework of the “Model QI System”, available existing resources would be utilised during implementation of the programme which would make the programme sustainable.

**Challenges during development of the model**
To involve and engage all the relevant stakeholders starting from national level down to upazila level were the main challenges faced during development of the model. As there was no unique model which could be applied for all nations of the world, we had to adopt the concept of quality improvement of health care of different countries. However, during development of the model, we had to consider about the condition of the infra-
structures, limited resource, huge patient load, behaviour of both health care providers and patients.

**Challenges during implementation of the model**
This “Model QI System” relies on the human behaviour of accomplishing the whole QI process. Therefore, it is unpredictable whether the human resources related to implementation of the process would act as expected. It would be also challengeable to incorporate the developed model into the government health system as it requires motivation of the human resource to be involved enthusiastically and regularly in to the new system.

### 6.3 Evaluation of the ‘Model QI System’ for its acceptability and feasibility

The “Model QI System” was piloted to evaluate its acceptability and feasibility and by the health care providers and beneficiaries of the 14 districts, and sub-district level hospitals of Thakurgaon and Jamalpur of Bangladesh. The pilot programme intended to strengthen the existing MNH services through introducing Quality Improvement system within health system to ensure quality in care at district and sub-district level hospitals.

During the programme the formation of various committees by the participation of team members and their district level and sub-district level managers was found participatory. The members were orientated on the concept, action plan and responsibilities. The committees and the teams have successfully conducted their monthly and quarterly meeting with specific outputs. Almost all teams were active and motivated to implement the programme. In this study the health care providers prioritised the areas of quality improvement and provided effort to improve those areas and a notable improvement was found. Overtveit in his study revealed that to make a QI program successful it is important to find out the priority areas where improvement is necessary and also requires both inter and intra departmental collaboration (116).

Some studies conducted in both developed and developing countries revealed lack of human resource preparedness of existing health care system and leadership engagement, lack of team spirit-relationship and teamwork, lack of setting accountability through developing self monitoring
system, less empowerment of nursing force, lack of innovation in taking decisions, execution of and motivation on QI issues and logistics management as the main challenges during implementation of QI programme (17-19, 45-51). However, the above mentioned challenges did not work as barrier to implement the QI programme due to simplicity of the implementation process. The improvement that has been noted during very short period of QI intervention was due to the improved motivation and understanding of the health system by the current efforts. The progress in implementing “Model QI System” as per guidelines and tools was smooth and implemented fully.

**Challenges during implementation of “Model QI System”**

1. *Adaptation of the tools:* The health care providers needed time to get adapted with the tools and the duration implementation process was only one year.

2. *Local context and cultural issues:* Quality always remain as a cultural issue. Ignorance and other cultural factors related to the patients often interfere the process of improving quality of health services. For example, basins were provided in several hospitals to ensure the handwashing, however, the patients put leftover food on it and the basins became useless.

3. *Frequent transfer of HCPs and staff:* Frequent transfer were one of the major barrier to implement QI programme. HCPs and staff were trained and motivated, and suddenly posted out in another department other than MNH related ward or other hospital. Regular QI activities were suffered due to this mobilisation.

4. *Attendant management:* In government hospitals the regular picture is presence of huge attendants who accompany the patients. These attendants bring the quality in threat. To keep the hospital environment clean became challengeable. The infection prevention systems also faced problem due to the huge number of attendants.
6.4 Methodological consideration

The thesis is comprised of four papers, and mixed methods including both qualitative and quantitative approaches were deployed as study design. Since 2011 to 2014, we have been conducted this research in 14 district and sub-district government hospitals of Thakurgaon and Jamalpur districts, Bangladesh. An adapted “Model QI System” was evaluated for its acceptability and feasibility which was developed stepwise. Firstly, existing quality of MNH services of selected hospitals were assessed and in second phase the “Model QI System” including its implementation framework, guidelines and tools were developed, and finally piloted in all 14 hospitals. The study settings were selected purposively in consultation with World Health Organization (WHO) Bangladesh country office.

To assess the quality of MNH care of district and sub-district level hospitals and to evaluate the feasibility and acceptability of the “Model QI System” which were described in paper I and paper IV, both qualitative and quantitative approaches were utilised. In paper II quantitative methods alone were utilised to assess the quality of infrastructures of hospitals and HCPs clinical performances. To develop the “Model QI System”, exploratory methodical approaches were used and the process of development of the “Model QI System” including its implementation process, guidelines and tools was illustrated in paper III.

In this study qualitative approaches included GDs, FGDs, IDIs, documents review and photography. Structured observation and exit interviews were utilised to obtain quantitative data. To assess health systems performance of LMICs like Bangladesh, it was essential to understand the social, economic and cultural contexts. We used qualitative approaches to understand and explain quantitative results which helped to develop survey tools, assess the quality of hospital MNH services, develop and evaluate the acceptability and feasibility of the programme for MNH care at district and sub-district level government hospitals in Bangladesh. In our research the quantitative approaches permitted us to identify the magnitude of the problems and realise how representative the findings were. At the same time qualitative studies enhanced the in-depth of our understandings by presenting various stakeholder perspectives and offer rationale for health systems performance.
6.4.1 Strengths of the studies
The thesis incorporated a comprehensive methodology to achieve its objectives. It started with exploration of the current quality of MNH care by deploying a mixed method, both qualitative and quantitative. The approaches complemented each other to obtain relevant data.

Developing a QI model system in a country like Bangladesh, where it is almost non-existent, is a very difficult task. To overcome this, evidence based interventions were reviewed and the findings of base line survey and documents review were shared with the researchers, health policy planners, professionals and program implementers to develop and evaluate the QI system. Without engaging these personnel a successful and acceptable model could not be developed or evaluated. These are the persons who would advocate or be directly involved in implementing such.

The “Model QI System” was implemented and evaluated for its acceptability and feasibility and the main strength of this study was utilisation of a broad-spectrum of qualitative methods, including FGDs, IDIs, documents review and photography.

6.4.2 Limitation of the studies
First, we considered only 14 government hospitals of two districts purposively. However, there are 64 districts in Bangladesh, which comprise 593 public hospitals.

Second, respondents of the exit interviews were the patients or their attendants who received MNH care from the selected hospitals and they were recruited through convenient sampling method. As the interviews were conducted within the hospital premise, the respondents might have fear or discomfort during replies. There might be a possibility not to get a true reflection of their feelings and there was a chance to have “courtesy bias”. In addition, the generalizability of the results might be limited due to the small number of study participants. However, it might be possible to transfer the qualitative results to other similar health care situations taking the context description into account.

The third limitation of the study was limited time for piloting the “Model QI System” in course of evaluation of its acceptability and feasibility.
Quality improvement is a continuous process and visibility of the changes takes times.

6.5 Recommendation and policy implications

The adapted “Model QI System” was piloted in 14 government district and sub-district level hospitals of Thakurgaon and Jamalpur districts. Through this pilot programme it was observed that by incorporating the QI programme in the regular hospital management system, the quality of care was improved.

However, to maximise the effectiveness of this QI system needs to paid special attention to reduce health care provider and staff turnover and improve the infrastructure to support improvement in MNH services. Therefore, a change in the policy is required to ensure the distribution of healthcare personnel and logistic support should be proportionate to population of the districts and sub-districts. Despite the low quality of MNH services, the patients’ satisfaction level remained always high. Attention on awareness-raising activities to educate the patients about the quality of care need to be emphasised during implementation of the programme. Extended follow-up is required in order to assess whether the positive changes of this intervention program on MNH care services is sustainable in the long term. A collaboration between national level health policy makers and district level decision makers is essential to make the programme successful and sustainable.

The current research was developed and implemented to assess the improvement of the quality the MNH care at district and sub-district level hospitals through different types of process indicators. However, further research should be conducted to measure the effectiveness of the QI model system in terms of outcome, that is, if the model is effective in reducing maternal and newborn deaths in Bangladesh and other similar settings. To understand its success and challenges this QI intervention needs to be implemented at district and sub-district hospitals nationwide.

Our current research focused only on district and sub-district level hospitals. Further research should be conducted to develop, implement and evaluate a QI model applicable for all three tiers namely primary, secondary and tertiary level hospitals. The system should also encompass the health facilities existing at the community.
7 Conclusions

The evidence provided in the thesis has public health importance and also new to the scientific community about the quality of care at a LMIC like Bangladesh.

In the baseline survey it was found that the quality of MNH care in terms of hospital infrastructures and clinical care performance of the health care providers at district and sub-district level hospitals of Thakurgaon and Jamalpur districts was found poor. However, through piloting the comprehensive evidence based QI model system the quality of hospital MNH services improved.

Utilising information collected from the document reviews, baseline survey and workshops the “Model QI System” was developed. Piloting of the model was done by incorporating it in the regular hospital management system using the existing hospital resources. The “Model QI System” was found acceptable to the top health managers, health care providers and hospital support staff and feasible to implement in district and sub-district level hospitals in Bangladesh.
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