ABSTRACT: Developing countries, particularly in their rural areas lack in health care facilities. In Pakistan, 65% of population lives in rural areas. The patients from these areas are unable to interact with the health specialists for their particular diseases. The complications faced by women during pregnancy are among the major issues in the health sector of rural areas. Due to lack of gynecologists in rural areas problems like mortalities occur. Despite having an infrastructure of Lady Health Workers (LHWs) for pregnant women in rural areas of Pakistan, practitioners face the problem of collecting information about the patient. This lack of information and communication has resulted in most unfortunate situation among pregnant women of villages. This article therefore proposes an application for LHWs and gynecologists using Personal Data Assistant (PDA) for real time communication and health care.

INTRODUCTION:
Women and children are the basic unit of society and currently women are contributing extensively to economic development. In spite of this vital role, they are facing social, environmental, political, and economic barriers that have a damaging influence on their health and well-being. Every year, over 350,000 women and about 9 million children die from preventable deaths and diseases that occur during pregnancy and after childbirth [1]. Most of the burdened women are the economically distressed, living in remote settings in low-and-middle-income countries. It is a great fear that with the United Nations’ Millennium Development Goals for 2015, developing nations will lag behind the achievement of their goals in reducing child mortality and improving maternal health. However, the improvement can be achieved through technologically innovative strategies [1]. In this context, there is a budding role of information and communication technologies (ICTs) in the dissemination of basic health and hygiene cognizance, information and monitoring services on nutritional requirements, in health scrutiny and forming a nationwide management and information service for the delivery of health services, and even in supporting prevention and control activities in case of epidemics, along with continuous monitoring of patients [2]. Over the years, ICT has reduced the gap and encouraged collaborations between national governments and diverse international stakeholders in putting on mobile-based health solutions (m-Health) as a powerful prospect for improving health and development in poor and remote areas.

In the least developed countries (LDC) some no-cost to low cost tool are currently being used for this purpose. For example, in African countries, web and mobile-based device called “EpiSurveyor” that permits its health workers to download and fill in forms and direct them to a central database to be examined and synthesized in real time is in vogue. Similarly, in Thailand’s smart phone application to improve antenatal care (ANC), immunization program, and prevention and treatment of malaria epidemics is being successfully used. In both Peru’s Nacer and Guatemala’s TulaSalud programs, Rapid SMS was executed to support and enable their CHWs to provide referrals, follow-up care, and monitor disease outbreaks on real-time access. Furthermore, in Gambia, mobile phones were equipped with SIM cards to contact emergency ambulance service for high-risk pregnancies and obtain access to surgical obstetric care [1].

From the above cited examples it can be concluded that ICT has been effectively used by patients and medical professionals for communication, searchable database, distant learning, inventory requirements and the patient's history, epidemiological analysis, disease Surveillance and for Arranged telemedicine, teleconferences, e-health cards, and medical Transcriptions [2]. Therefore, ICT is a decent preference for the development of health care services in rural communities, which have inadequate resources and greater need for outreach within short time duration.

A Case of Pakistan:
Pakistan is one of the 11 countries that accounted for 65% of global maternal mortality in 2008 with India and Bangladesh, having major segment in maternal deaths globally [3]. ANC services utilization in rural areas is lower at about 10% [4]. Therefore, in Pakistan, the maternal mortality ratio (MMR) is highest in rural areas and less developed Provinces. The situation in Balochistan Province is especially severe. In Balochistan, the MMR stands at 750 maternal deaths per 100,000 live births [5] as compared with 227, 314, and 275 in the other provinces of Punjab, Sindh and Khayber Pakhtoon Khwa, respectively [6]. Utilization of routine antenatal care at government health facilities in Pakistan is generally low.

The Government of Pakistan has been active in the provision of maternal health services during the last two decades through primary, secondary, and tertiary health facilities, augmented by the Lady Health Workers (LHW) Program [7]. About 100,000 LHWs are the strength of the primary health care system. A number of maternal health projects have been launched with the cooperation of international
donor agencies [8]. However, according to Victoria and Nicogossian, (2011), Pakistan’s Lady Health Workers (LHW) original scheme, launched in 1994, were set out to be primary health care providers in rural, remote districts, still facing challenges in preventing high mortality and infant rates due to their deficiency in communication and delays to gain access to emergency care. Thus, there is an acute need of a health monitoring system using Information & Communication Technology (ICT) that could boost the services for health to the rural population of Pakistan. A system which could enhance the level of information sharing while maintaining medical records of rural and impoverished patients in order to provide efficient health services. Furthermore, there is a need of devising reliable medical strategies with the help of knowledge extraction, which will be achieved from a collection of reliable and accurate data.

**Proposed Application:**
The paper proposed and developed an application for LHWs and gynecologists using Personal Data Assistant (PDA). LHWs are trained to fill the patient information on the PDA, which is transferred to a computer server. Clinical Decision Support System (CDSS) analyzes this data and automatically sends feedback to the LHW. In case of problem, the case is forwarded to the gynecologist on their PDAs (Figure 1). These gynecologists send their feedback to the respective LHW who then treats the patient. Another feature of this system is that the system maintains this electronic data of the patients for future use. This helps in the long-term health maintenance of the patient as well as for medical/scientific research purposes.

This system consists of three major parts: mobile unit, consultant terminal and management unit. As it is shown, in the first phase all data about patients such as HR, ECG, HB, SPO2 and body temperature is gathered and transferred to the user interface through WLAN. First of all, the user should register in the system and make a profile and login to the system then, user interface deals with LHWs and they can easily interact with this application. Similarly, after attaching the medical sensor modules to the patient’s body, data will be transferred to the PDA for sending to the hospital server. Alerts and message manager and security and user manager are two main parts of user interface section and they provide more facilities to users because one of the aim of this part is being user friendly so, by providing simple and user friendly interface, we can interact with users more efficiently. After entering data into PDA, the data will transfer through GPRS or TCP/IP infrastructure to the main server, which located in the hospital and will save in Electronic Medical Record system (EMR) database. The EMR database includes all information about patients and their histories. The server will record the data into the patient’s database using EMR. In the next level, Clinical Decision Support System (CDSS) analyzes the patient’s physiological data such as ECG, body temperature, and heart rate in order to investigate symptoms of any abnormality. Then CDSS send the feedback to consultant’s doctors.

![Figure 1: Proposed and developed an application for LHWs and gynecologists using Personal Data Assistant (PDA).](image-url)
laptop or PDA and according to this information, doctors send advice or prescription to the LHW’s PDA.

CONCLUSION:
m-Health emerged as a new option for addressing the prenatal and newborn health. Above-mentioned evidences indicate that mobile technology has empowered the service providers as well as the recipients of the health services. The governments in the developing countries like Pakistan should incorporate m-health in the health management system in expediting emergency obstetrics referrals and enabling health workers to collaborate and improve the delivery of health care.

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REFERENCES: