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IMPLEMENTATION OF KANGAROO MOTHER CARE

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ABSTRACT

Kangaroo Mother Care [KMC] is an evidence-based approach to reducing mortality and morbidity in preterm infants and as a key intervention package for caring of premature newborns it was designed, planned, and implemented with the practical aim of reforming the low birth weight and premature infants' health care in Iran during the last 5 years. In this article, the different steps leading to successful implementation of KMC in Iran have been In the first phase of this intervention [2007-2009], KMC national service package was designed as an introduction to KMC, skills development in KMC practice and the management of implementation. In the second phase [2009-2011], advanced skills development for regional steering committee members was sought and the service package was implemented in several tertiary level university hospitals. In the third phase [2011], a nationwide assessment of progress monitoring and a situational analysis of the health-care settings were conducted. Main outcome measures were description of practices, services and facilities for KMC and the effects of KMC on mothers, infants and health team workers.According to monitoring and evaluation in 2011, KMC program has been implemented in 53% of the hospitals and there were favorable evidences of KMC practice in NICUs. Based on the pilot study, neonatal wellbeing at the time of discharge has been improved after intervention [$p<0.05$]. Eighty-nine percent of mothers pointed out that KMC increased their self-confidence and 84 % of them were satisfied in KMC services. Eighty-four percent of the participating staff believed that KMC program had improved the care giving to the premature newborns and 86 % of them pointed out that they were impressed by better emotional relationship between mother and her child. The results also demonstrated that the main obstacles for implementing KMC were family acceptance and social support.Implementation of the nationwide KMC program is possible and leads to promising outcomes. However, further family and social support is needed for health care system.

Key words: Kangaroo Mother Care [KMC], Premature Newborn, Neonatal Intensive Care Unit [NICU].

INTRODUCTION

Globally, 44% of under–five deaths occur during the neonatal period, and the proportion of under–five deaths due to neonatal causes continues to rise [1]. Prematurity is the largest direct cause of neonatal mortality, accounting for an estimated 29% of the 3.6 million neonatal deaths every year and low birth weight [LBW] is an underlying factor in 60– 80% of all neonatal deaths [2]. In 2010 neonatal mortality rate NMR] and the under-5 mortality rate [U5MR] were 14 per 1000 live births and 26 per 1000 live

births in Iran [3]. According to the Millennium Development Goal [MDG] 4, should reduce from 26 to 22 per 1000 live births until 2015 [4]. Reducing NMR is a main goal to reduce U5MR. A significant proportion of deaths among preterm and low birth weight infants are preventable. As described by World health organization [WHO], KMC is the early, prolonged and continuous skin-to-skin contact between the mother [or adult substitute] and her baby—both in hospital and after discharge—with support for feeding [ideally exclusive breastfeeding] and close follow-up after early discharge from the hospital [5].There is evidence that kangaroo mother care [KMC], when compared to conventional neonatal care in resource–limited settings, significantly reduces the risk of mortality in infants born in facilities who are clinically stable and weighing less than 2000 g [2, 6, 7]. Meta-analysis of three RCTs commencing KMC in the first week of life showed a significant reduction in neonatal mortality relative risk [RR] 0.49, 95% confidence interval [CI] 0.29-0.82] compared with standard care [2]. Several other beneficial outcomes have been reported by using KMC as a method of care [1]. Five RCTs suggested significant reductions in serious morbidity for babies <2000 g [RR 0.34, 95% CI 0.17-0.65], [7]. Research from various countries also suggests that KMC is a cost-effective method for treating preterm infants [8, 9], that mothers who have practiced KMC may find it acceptable [10, 11], and that KMC can have a positive impact on the health of mothers in certain cases. Moreover, KMC was found to increase weight, length and head circumference gain and exclusive breastfeeding at discharge or 40 to 41 weeks' postmenstrual age and at one to three months' follow-up[12]. These better growth results could reduce the morbidity and mortality as well. As hypothermia, oxygen desaturations, inability to suck and swallow breast milk effectively and poor bonding and contacts between mother and her tiny child are the main problems leading to high morbidity and mortality in preterm, LBW neonates, KMC might help better care of these neonates. Hypothermia has shown to be reduced effectively and mean temperature rose by about 0.4°C [6] in neonates cared skin to skin with their mothers, and statistically significant improvement in vital physiological parameters have been shown [6]. Even in intubated infants under 1500 g, KMC has stabilized their vital signs and improved oxygenation [13].KMC effects breast feeding practices and in the article by Heidarzadeh et al. there was a 4.1 time increase in exclusive breastfeeding by KMC mothers [14]. Skin-to-skin contact during breastfeeding seems to immediately enhance maternal positive feelings and shorten the time it takes to resolve severe latch-on problems in infants and increase breast feeding success rate [15].The psychosocial effects of KMC include reduced stress and enhanced mother-infant bonding, with positive effects on the family environment and the infant's cognitive development. As it is shown in the article by Gathwala, attachment score in the KMC group mother has been shown to be significantly higher and mothers were more often the main caretaker of their babies. Mothers were significantly more involved in care taking activities like bathing, diapering, sleeping with their babies and spent more time beyond usual care taking. They went out without their babies less often and only for unavoidable reasons. They derived greater pleasure from their babies. It was found that KMC can improve negative maternal mood [e.g., anxiety or depression] and promote more positive parent-child interactions [16]. Research on kangaroo care reports physiologic safety for preterm infants and increased attachment for parents. Attachment promotes nurturing behaviors that support growth and development [14].There are a few articles working on the effect of KMC on later development of preterm infants. Korraa has shown that kangaroo mother care improves cerebral blood flow, thus it might influence the structure and promote development of the premature infant's brain [17].Despite strong evidence for mortality and morbidity reduction in low– and middle–income settings and endorsement from the World Health Organization [WHO], country–level adoption and implementation of KMC has been limited [1]. In a systematic assessment of health system bottlenecks among countries with a high burden of neonatal deaths, KMC was identified as an intervention with significant health system barriers to scale–up including leadership and governance, health financing, health workforce, health service delivery, health information systems, and community ownership and partnership [18]. Health intervention priority–setting tools, such as the Every Newborn Action Plan [ENAP] [19], the Lives Saved Tool and Child Health and Nutrition Research Initiative methodology, have identified KMC as a high priority intervention based on criteria such as mortality benefit and equity [20-22]. To adequately implement and effectively scale-up this intervention, it is critical to understand the key factors that contribute to a mother's [in]ability to practice KMC [23]. There are some barriers to KMC practice that mothers and other stakeholders face while practicing KMC, and they should have been

addressed before implementation of this practice. For example, in a trial of community-initiated KMC with 1,565 mother-infant pairs, only 23.8% practiced skin to skin contact [SSC] for more than 7 hours / day in the first 48 hours of life, and the average number of hours of SSC during days 3–7 of life was 2.7 ± 3.4 hours [24]. Of the top five barriers to KMC practice identified for mothers, four were resource-related. The top two barriers to practice identified—"Issues with facility environment / resources" and "Negative impressions of staff attitudes or interactions"—were specific to the facility setting. "Fear / anxiety of hurting the infant," an experiential barrier to practice, was ranked third. Resource-related barriers that are relevant both inside and outside the facility—"Lack of help with KMC practice and other obligations" and "Low awareness of KMC / infant health"—were ranked fourth and fifth [23]. Resourcing and sociocultural factors were emerged as the top barriers to KMC adoption for nurses. The resourcing barriers "Actual increased workload / staff shortages" and "Lack of clear guidelines / training" were in the top five barriers for nurses when considering publications from all geographies. The top-ranked barrier for fathers was "Lack of opportunity to practice." The top-ranked barrier for physicians was "General lack of buy-in / belief in efficacy." The top-ranked barrier for program managers was "Need for high-touch support from staff [23]. As the benefits of KMC practices were shown and KMC could be integrated in the current healthy and sick newborn protocols, the Iranian neonatal health office decided to implement this practice in different parts of Iran. This paper has reviewed how KMC program was designed, planned and implemented in healthcare facilities in Iran.

METHODS

First Phase Introduction of KMC: Beginning in 2007, several focus group discussions were held among experts of neonatology as well as NICU staff with the aim of introducing and clarifying different operational aspects of the topic.There were several issues regarding the timing of initiation, duration of SSC, positioning, necessary equipment and supplies , physical setting , human and financial resources, training, provisions as well as motivating service providers to practice KMC at hospital and at home, discharge criteria, follow–up frequency, indicators and measurement, and health workforce needs. Care efficacy indicators were also determined. National service package for KMC was designed and introduced to health workers.Training medical personnel and parents and asking for changes in the environment and equipment were followed in 2007-2008. A pilot study in Mahdieh tertiary care NICU was performed in 2008 to study the barriers and effects of KMC and the defined indicators were calculated in infants admitted to NICU [n=104] during 2 months. Attitude and satisfaction of staff [n=41,] and mothers [n=60] toward practicing of KMC were studied. Data was analyzed and discussed in the meetings. Second Phase [Limited Implementation]: The next step was to introduce KMC practice on a broader scale through the universities of medical sciences nationwide. From 2009 to 2011, four universities in different parts of Iran, Isfahan [center], Mashhad [North East], Tabriz [North West] and Shahid Beheshti [capital] were selected as the main contributors. More than 200 medical practitioners and nurses have been trained to KMC methods with translated booklet "The Practical Guide of KMC", developed by WHO in 2003. Management issues were discussed as well as technical knowledge and skills. Furthermore KMC was introduced to the mothers through the prenatal trainings and for parents of premature infants. Handbooks, multimedia and pamphlets were created for training parents. At the same time the first version of KMC guidelines was written and a number of motivated tertiary level settings established KMC practicing in NICUs.Third Phase [Monitoring]: A nationwide monitoring of implementing KMC program and a situational analysis of the health-care settings was performed in 2011. Checklists were developed by the experts according to the practice guidelines of KMC. These checklists were completed in 294 hospitals. [192 secondary [Secondary level hospital is a hospital that has neonatal ward] and 102 tertiary [Tertiary level hospital is a hospital that has NICU] levels]. Also questionnaires were designed for mothers of NICU-admitted infants. In each hospital 4-5 mothers of admitted infants in NICU and 4 nurses [convenience selection] were asked to respond to questionnaire. According to executives comments the preliminary service package was edited and the modified version including 5 chapters was published in 2012. KMC service Package's chapters are:

1- Clinical guideline for KMC
2- Physical setting, equipments and facilities
3- Training
4- Executive mechanisms

5- Monitoring and evaluation
The KMC was notified as a nationwide program in 2012.

RESULT

Running the first phase developed qualitative and quantitative achievements. Topics discussed in the sessions are listed in Figure 1. Material to develop the service package was discussed and service package was distributed in the whole country. Data belonging to 2-month period prior to implementation compared with the data of the same period after 6-month practicing KMC. Maternal variables [age, parity, pregnancy care, chronic and pregnancy induced disease] had no significant difference between groups. Neonatal parameters [gestational age, Apgar score, birth weight] were also the same. Mortality rate as the main outcome was reduced from 9.8% before to 0% after the implementation which was significant. [P=0.02]. KMC improved recovery by 1.29 times. [P=0.04] Yet the other indicators such as care needed, feeding and complications did not differ significantly.The staff believed that KMC improved serving premature newborns and had better health outcome. They said emotional bonding of mothers and infants encouraged them in their practice. Mothers also were satisfied with the services provided to their babies. They believed that KMC was more effective than other care methods and accelerated infant's recovery. Monitoring: From 286 secondary and tertiary level hospitals [189 secondary and 97 tertiary level] over the country 263 settings [170 secondary and 93 tertiary levels] answered the question about implementation and practicing KMC [Total Response Rate = 92%]. The KMC program was implemented in 47.1% of the secondary level and 69% tertiary level hospitals. The frequency of hospitals who reported implementation of KMC in different provinces of Iran is shown in figure 2. In 48 out of 183 hospitals [26%] with KMC implementation, they had documentation of the procedure. 75 hospital didn't document and the data of 103 hospital was missed. 72% of hospitals practiced intermittent KMC. The KMC staff training coverage is shown in table 1. Four hundred forty four mothers through 102 secondary and tertiary level hospitals, whose infants were admitted in NICU, answered the questionnaires. 76% of them practiced KMC. Among these, 123 mothers [28%] were trained for KMC during pregnancy. 303 mothers [89%] believed that they were capable of taking care of their infants at home practicing KMC. The percent of mothers who reported practicing KMC in NICU in different provinces of Iran is shown in figure 3.

DISCUSSION

Perinatal conditions are the reason of about 21% of infant mortality in developing countries [25]. However, this issue can be prevented by a convenient and accessible intervention. The kangaroo mother care [KMC] a method of care of preterm and low birth weight infants was devised by Héctor Martinez Gómez and Edgar Rey Sanabria more than 4 decades ago [26]. In a general overview KMC has three main components including skin-to-skin contact, reastfeeding and comprehensive support to the mother and infant [27]. Kangaroo Mother Care interventions, as the standard strategy, intends to care infants and amend their conditions not only for premature but also for full terms. The background and scientific history and evidence of Kangaroo Mother Care have confirmed advantages and benefits of this technique for Prevention of morbidity and mortality through easy, efficient and inexpensive intervention and outside the hospital. A lot of studies have been conducted to determine and describe the scientific evidence of KMC practice and its beneficial effect for reducing morbidity and mortality rate improvement of infants neurological and psychological circumstances [28]. Venancio et all in 2004 described the history of KMC scientific evidence and its effect on breastfeeding. They reviewed many papers around KMC between 1983 and 2004. Their analysis revealed that KMC is mainly involved in protection factor to breastfeeding and gain of weight. It is also associated with the following reduced risks such as infections, severe illness, and respiratory tract disease. They finally concluded that KMC efficiently Impacts on breastfeeding and reduction of infant morbidity. However, they declared that there are not enough scientific evidences for its routine use [29]. Almeida and colleagues evaluated the KMC function on heart, respiration, blood pressure etc of low-weight preterm newborns. Their study results revealed that heart rate and mean arterial pressure were not influenced by KMC practice [p> 0.05] while temperature, respiration rate and peripheral oxygen saturation were

significantly changed [p< 0.05]. At the end of the study, they concluded that KMC lead to beneficial improvement in the vital signs of low-weight newborns [25]. Grace and colleagues in 2016 investigated the influencing factors on KMC. They reviewed 112 qualitative studies from 1960 to 2015 to develop a conceptual model for its recommendation in health systems. Their inference it was that some obstacles such as family acceptance and social support, prevents implementing KMC. They suggested that the high user engagement is the main Key to Racing Success in KMC implementation. They also stated that in order to use KMC practice in different conditions more researches about designing and testing KMC models are needed [30].The major finding of the this pilot study was reduction of neonatal mortality rate and improvement of recovery by KMC. Also both staff and parents were pretty satisfied with KMC practice. After implementation of KMC in a number of hospitals over the country, we ran a monitoring project in all hospitals. KMC was reported to be implemented in more than 50% of hospitals [156 out of 263]. The data for 8% of the settings is missing. Documentation of the KMC in practicing hospitals is low which is expected to improve after the official notification. The intermittent KMC was the most implemented one. Also more workshops and education programs for the staff, practitioners and specialists are needed. 100% of neonatologists and at least 60% of staff [nurses and midwives] are expected to be trained for KMC practice, while it is done 76% of neonatologists and 30% of staff. More than 75% of mothers said that they practiced KMC in the NICU. It seems that this rate is overestimated. The mothers' questionnaires were completed by present mothers in the NICU. So, the probability of sampling from KMC practicing mothers was higher than others who might not practice it. KMC training during pregnancy was very low [28% for these mothers] and it alarms us to put more effort in mothers' training in pregnancy. Practicing KMC in NICU made them confident of taking appropriate care of the newborns after discharge.

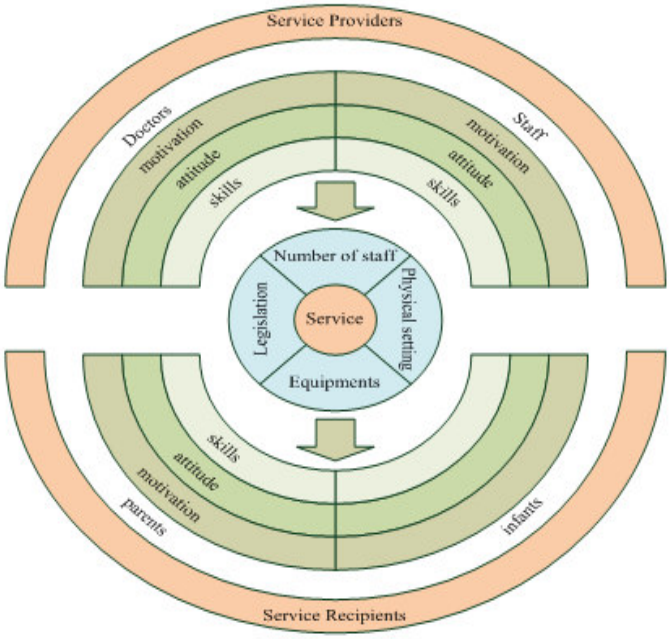

Figure 1

KMC is a service that its providers are doctors and staff and its recipients are parents and infants. This service has 4 main parts [blue parts in the figure]: human resources [Number of staff], place [Physical setting], tools [Equipments] & laws [Legislation]. Each of providers and recipients has 3 levels of motivation, attitude and skills. All of these topics were discussed in the FGDs.

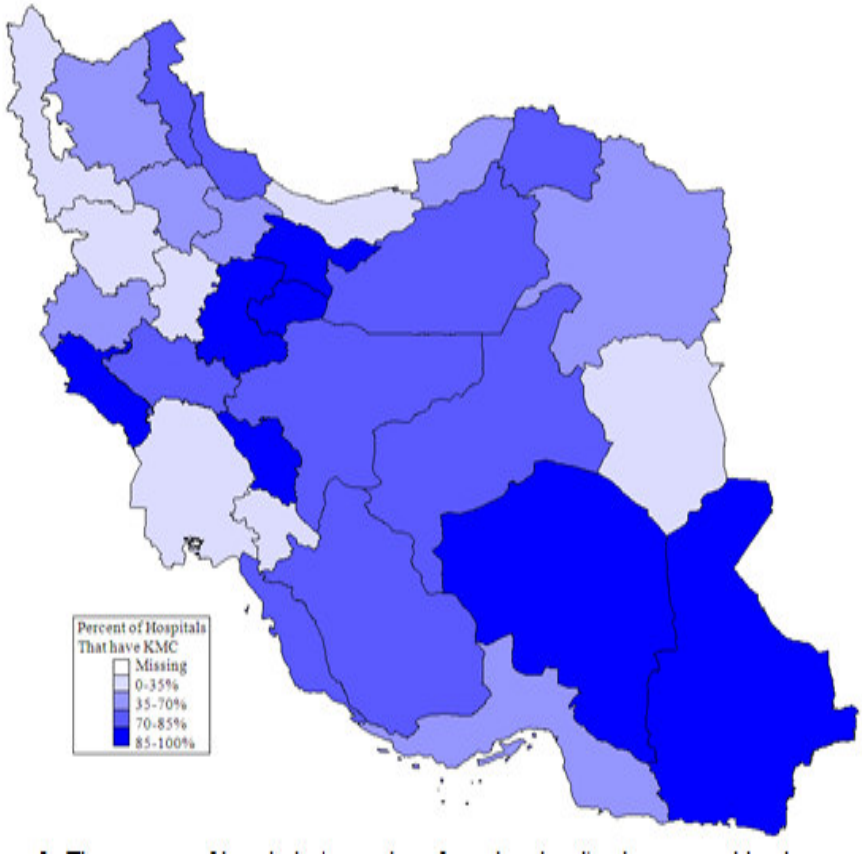

Figure 2
The percent of hospitals [secondary & tertiary level] who reported implementation of KMC in different provinces of Iran

Table 1
The proportion of staff & practitioners who had passed educational workshop of KMC in secondary level hospitals [n=198] & tertiary level hospitals [n=98]

$$Proportion = \frac{\text{hospital personel who had passed educational workshop of KMC (EN)} * 100}{\text{Total number of personel of hospitals (TN)}}$$

	secondary level hospitals [n=198]			tertiary level hospitals [n=98]		
	TN	ED	Rate	TN	ED	Rate
Midwife	2605	770	29.6	1972	666	33.8
Nurse	4609	1193	25.9	4943	1368	27.7
GP	440	82	18.6	194	28	14.4
Pediatrician	656	232	35.4	399	122	30.6
Gynecologist	1458	229	15.7	619	132	21.3
Neonatologist	38	29	76.3	118	90	76.3
Perinatologist	6	4	66.7	17	10	58.8
Educational Supervisor	181	67	37	100	39	39
Clinical Supervisor	683	136	19.9	436	92	21.1

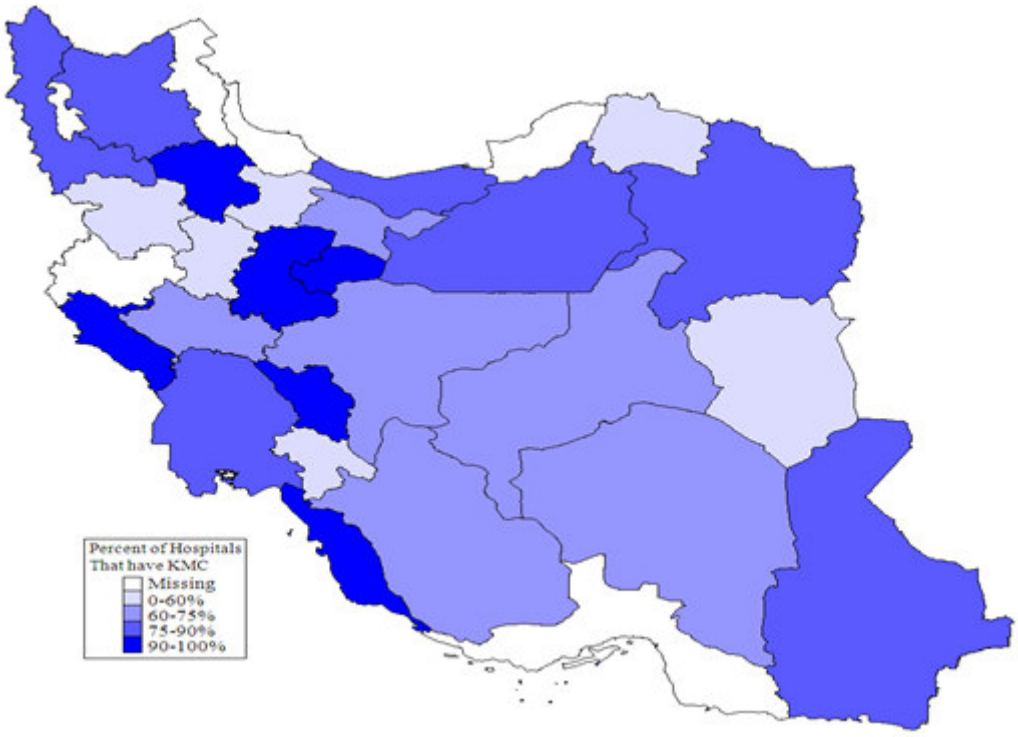

Figure 3
The percent of mothers who reported practicing KMC in NICU in different provinces of Iran

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