Postnatal Kangaroo Mother Care Practice at Home and Comparison of Improvement in Vital Parameters in Low-Birth-Weight Babies In-Home Setup and Non-Teaching Hospital Setup in Rural Coal Mines Area Jharkhand, India: A Community-Based Prospective Observational Study

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Research article

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Abstract

Background

Low birth weight (LBW) newborns especially those < 2000 gms are more prone to hypothermia due to which other physiological parameters gets deteriorated in 1st week of life. The objective of this observational study was to continue Kangaroo Mother Care practice at home and to ascertain whether KMC was effective in improving the vital parameters of LBW babies when it is given at home in a rural coal mines area, in Jharkhand, India.

Methods

This study was a community-based prospective observational study, done over three years from November 2019 to November 2022. In this study, we included 156 pairs of both mothers and LBW babies (weight 1500 to < 2000 gm). After discharge from the hospital on day 3, KMC was continued at home on day 4, day 5, and day 6. Data of four physiological parameters namely temperature, oxygen saturation, respiratory rate, and heart rate, were collected before and after KMC and analyzed.

Results

Among 400 newborns, 156 LBW babies (39.0%) who were given KMC at home, showed similar but statistically significant improvement of vital parameters, especially in temperature and oxygen saturation(p < 0.0001) compared to the same babies 156(39.0%) given KMC in the hospital (p < 0.001).

Conclusion

Kangaroo Mother Care, which was continued at home, has a significant role in the Improvement of vital parameters especially concerning temperature and oxygen saturation. If the babies in the weight range of 1500 to < 2000 gm are healthy, well-breast fed, and have no other risk factors can be discharged early, and managed at home by delivering supportive care, nursing care along with Kangaroo Mother Care with continuous follow-up.

INTRODUCTION

The most common cause of complications and mortality in newly born babies in developing countries is Low Birth Weight (LBW) [1]. It has been observed in a study that out of 25 million LBW newborns delivered each year all over the world, the great majority of them (96%) are in low income and middle-income countries [2]. It has also been observed that LBW newborns die more often in developing countries compared to developed countries [3]. Out of 25 million LBW babies worldwide, 8 million are in India [4]. Therefore, worldwide India has the maximum number of preterm birth and the consequence of that, maximum number of neonatal deaths [5]. LBW/premature babies are at greater risk of complication and death because their ability to control their body temperature is weak i.e., they get cold or hypothermic very quickly. Hypothermic newborns stop their feeding and there is a deterioration of other physiological
parameters [6]. It has been seen in a report in India that 2.9% of intramural babies and 45% of extramural babies in suburban and rural areas, developed moderate to severe types of hypothermia [7]. Kangaroo mother care has emerged as a boon for these areas. It is a non-conventional low-cost method for newborns that provides warmth, touch, and security to the LBW in such places. It reduces the complications and overall mortality, early discharge from the hospital, increases the confidence and self-esteem in the mother, and bondage between mother and baby [8]. However, KMC needs to be taught to the mother by a motivated team, and for better effectiveness, its effects need to be demonstrated to the mother by caregivers [9]. Our hospital is situated in a rural coal mines community and population of this area is economically very weak. Due to high number of Covid-19 cases during our study period, mothers and relatives did not want to stay in the hospital. Therefore, we planned to continue KMC at home to save such type of LBW newborns. KMC was initiated in the hospital and continued at home until the infant needs it, and for optimum care, a regular follow-up was ensured [10].

This observational study aims to continue Kangaroo Mother Care practice at home and to ascertain whether KMC was effective in improving the vital parameters of LBW babies when it is given at home in a rural coal mines area, in Jharkhand, India.

**METHODS**

Tata Central Hospital, West Bokaro a 60 bedded multispecialty secondary- care with up to level 1 NICU facility, situated in a rural coal mines area in Ramgarh district of Jharkhand, India. This hospital caters to the local population of the rural and suburban areas and more than 40 villages are sitting around the hospital.

**Study design**

This was a community-based prospective observational study.

**Study setting**

This study was carried out in the pediatrics and neonatal department of Tata Central Hospital. This study was also carried out at residents of mothers or attendees situated 10–15 kilometers encompassing the hospital.

**Study period**

The study was commenced in November 2019 and was completed in November 2022. This study took three years to complete.

**Ethical clearance**

Before the initiation of the study ethical approval was obtained from the hospital’s ethics committee - No. WBD/HA MED/49/1329/2019, dated November 14, 2019. After the training session and motivation,
written informed consent was taken from all participant mothers.

**Inclusion and Exclusion criteria**

Babies weighing 1500 to < 2000gm, well fed and whose vitals were stable, were included and babies weighing < 1500 gm and > 2000 gm, delivered with severe diseases, with gross congenital malformation, and whose mother refused to give consent even after repeated training and counselling were excluded from our study.

Among 400 LBW delivered during our study period, 244 (61.0%) were excluded because 25 (10.24%) LBW had severe sepsis with congenital abnormalities, 12 (4.91%) LBW had severe meconium aspiration syndrome with asphyxia, 14 (5.73%) LBW had severe respiratory distress, weight of 9 (3.68%) LBW newborn were < 1500 gm, mothers and relatives of 21 (8.60%) LBW newborns refused to give KMC and weight of 163 (66.80%) newborns were > 2000 gm. We included 156 (39.0%) pairs of both mothers and inborn LBW babies (weight 1500 to < 2000 gm), and babies were divided into two groups, group A which were given KMC in the hospital (n = 156) on day 1, day 2 and day 3 and group B in which the same babies were given KMC at home (n = 156) on day 4, day 5 and day 6.

**Methodology**

We formed a group of sisters, paramedical staffs and pediatricians for the successful completion of this study. This group consisted of six nursing staff, four paramedical staff, and two pediatricians working in the pediatrics, maternity and neonatal ward. Our highly trained and experienced paramedical staff, nurses and pediatricians arranged training sessions about KMC, breastfeeding, and their benefits for every mother and their family members.

After resuscitation of delivered baby, we used to put the baby on mother’s chest(abdomen) for skin-to-skin contact. After stabilization of newborn and mother, KMC was given for a fixed time duration of 60 minutes, 120 minutes, and 180 minutes for the 1st, 2nd, and 3rd days in the hospital respectively (group A). After discharging the mother and newborn on the 3rd day, same baby was given KMC for a fixed time duration of 60 minutes, 120 minutes, and 180 minutes for the 4th, 5th, and 6th days at home respectively (group B). Our trained nurses, paramedical staff, and pediatrician used to visit at home for assisting and providing KMC.

**Data collection**

A register (logbook) was used to collect data for four basic physiological parameters like temperature, oxygen saturation, heart rate, and respiratory rate before and after KMC in the hospital on day 1, day 2, day 3 and at home on day 4, day 5 and day 6 respectively. After collecting the data, we embedded it into a predesigned Proforma in Microsoft Excel 2010 sheet. Data was collected by a simple and easily available instruments from hospital and home. The temperature was recorded (F°) by a simple digital thermometer by keeping it in the axilla. Respiratory rate (per minute) was measured by looking at chest movements.
Heart rate (beat/minute) was recorded by using a pediatrics stethoscope and Oxygen saturation (%) was recorded with the help of a pulse oximetry by keeping it on a finger (thumb or big toe).

**Statistical analysis**

Data was collected using MS Excel. All tests were two-sided and a p-value < 0.05 was significant. The analysis was done using SPSS, Chicago, IL USA Version 21.0). Data have been summarized by Mean (SD), ranges. All four physiological variables were non-normally distributed. Mean values of before and after KMC in hospital care and home care separately were compared by using the Wilcoxon sign rank test. Similarly, the average parameters of before KMC and after KMC concerning home care and hospital care were also assessed by using Wilcoxon signed rank test and found to be significant which means KMC at home setup was similar but statistically significant.

**RESULTS**

There were 400 LBW newborns delivered in our hospital within our study period; among those 244(61.0%) newborns were excluded as they couldn't fulfil our selection criteria. We included data of 156(39.0%) LBW newborns for the hospital KMC setting on the 1st ,2nd, and 3rd days and after discharging from hospital the data was repeated from same baby during KMC session at-home on the 4th ,5th, and 6th days respectively. We didn't include less than 1500 gm LBW in our study as our hospital does not have a tertiary care facility. Characteristics of LBW babies as a form of gestational age in weeks, birth weight in gram, gender and mode of delivery are shown in (Table 1).
Table 1
Characteristics of LBW babies

<table>
<thead>
<tr>
<th>Total LBW Delivered within Study Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>400</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Characteristics of LBW babies

<table>
<thead>
<tr>
<th>Characteristics of LBW babies</th>
<th>Total Study group in Group A and Group B (n = 156)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
</tr>
</tbody>
</table>

1. Gestational Age (Weeks)

| 31–31.5 | 96 | 61.53 |
| 32–32.5 | 52 | 33.33 |
| 33       | 8  | 5.12  |

2. Birth weight (Grams)

| 1500–1600 | 96 | 61.53 |
| 1700–1800 | 52 | 33.33 |
| 1900       | 8  | 5.12  |

3. Gender

| Male       | 66 | 42.30 |
| Female     | 90 | 57.69 |

4. Mode of Delivery

| Normal | 69 | 44.23 |
| LSCS   | 87 | 55.76 |

LBW Low Birth Weight, LSCS Lower Segment Caesarean Section

Improvement in temperature:

During KMC in the hospital (Group A), we observed that the mean temperature before KMC on day 1, day 2 and day 3 was 95.03, 95.60, and 96.19 and after KMC it was 95.68, 96.13, and 96.55 respectively (p < 0.001) as shown in (Table 2). Whereas, during KMC at home (Group B), the mean temperature before KMC on day 4, day 5, and day 6th was 95.62, 95.94, and 96.29 and after KMC it was 97.66, 97.74 and 97.80 respectfully (p < 0.0001) as shown in (Table 3). There was a similar but statistically significant improvement in temperature in group B.
Table 2
Characteristics of four Physiological parameters recorded during Kangaroo Mother Care in the hospital (Group A).

<table>
<thead>
<tr>
<th>Physiological parameters (n = 156)</th>
<th>Statistics</th>
<th>Day-1</th>
<th>Day-2</th>
<th>Day-3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Before KMC</td>
<td>After KMC</td>
<td>Before KMC</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(n = 156)</td>
<td>(n = 156)</td>
<td>(n = 156)</td>
</tr>
<tr>
<td>Temperature (F)</td>
<td>Mean (SD)</td>
<td>95.03 (0.91)</td>
<td>95.68 (0.64)</td>
<td>95.60 (0.59)</td>
</tr>
<tr>
<td></td>
<td>Range (Min, Max)</td>
<td>3.6 (93.2, 96.8)</td>
<td>2.7 (94.2, 96.9)</td>
<td>3.0 (94.2, 97.2)</td>
</tr>
<tr>
<td></td>
<td>P value</td>
<td>&lt; 0.001</td>
<td>&lt; 0.0001</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>O₂ Saturation</td>
<td>Mean (SD)</td>
<td>86.48 (5.16)</td>
<td>89.64 (2.93)</td>
<td>90.71 (2.37)</td>
</tr>
<tr>
<td></td>
<td>Range (Min, Max)</td>
<td>23.0 (70.0, 93.0)</td>
<td>12.0 (82.0, 94.0)</td>
<td>12.0 (82.0, 94.0)</td>
</tr>
<tr>
<td></td>
<td>P value</td>
<td>&lt; 0.0001</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Heart rate (BPM)</td>
<td>Mean (SD)</td>
<td>125.88 (9.14)</td>
<td>126.86 (6.98)</td>
<td>132.69 (8.03)</td>
</tr>
<tr>
<td></td>
<td>Range (Min, Max)</td>
<td>48.0 (100.0, 148.0)</td>
<td>34.0 (110.0, 144.0)</td>
<td>48.0 (112.0, 160.0)</td>
</tr>
<tr>
<td></td>
<td>P value</td>
<td>&lt; 0.001</td>
<td>&lt; 0.001</td>
<td>0.088</td>
</tr>
<tr>
<td>Respiration rate (per minute)</td>
<td>Mean (SD)</td>
<td>32.06 (6.47)</td>
<td>36.85 (4.75)</td>
<td>38.78 (6.04)</td>
</tr>
<tr>
<td></td>
<td>Range (Min, Max)</td>
<td>26.0 (24.0, 50.0)</td>
<td>20.0 (28.0, 48.0)</td>
<td>30.0 (28.0, 58.0)</td>
</tr>
<tr>
<td></td>
<td>P value</td>
<td>&lt; 0.0001</td>
<td>0.061</td>
<td>0.071</td>
</tr>
</tbody>
</table>

BPM Beats per minutes, F Fahrenheit, KMC Kangaroo mother care, SD Standard deviation
Table 3
Characteristics of four Physiological parameters recorded during Kangaroo Mother Care at home (Group B).

<table>
<thead>
<tr>
<th>Physiological parameters (n = 156)</th>
<th>Statistics</th>
<th>Day-4</th>
<th>Day-5</th>
<th>Day-6</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Before KMC</td>
<td>After KMC</td>
<td>Before KMC</td>
<td>After KMC</td>
</tr>
<tr>
<td>Temperaure (F)</td>
<td>Mean (SD)</td>
<td>95.62 (0.66)</td>
<td>97.66 (0.40)</td>
<td>95.94 (0.54)</td>
</tr>
<tr>
<td></td>
<td>Range (Min, Max)</td>
<td>3.6 (93.5, 97.1)</td>
<td>1.7 (96.8, 98.5)</td>
<td>2.5 (94.5, 97.0)</td>
</tr>
<tr>
<td></td>
<td>P value</td>
<td>&lt; 0.0001</td>
<td>&lt; 0.0001</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Oxygen saturation</td>
<td>Mean (SD)</td>
<td>86.69 (3.57)</td>
<td>97.55 (1.23)</td>
<td>90.76 (2.95)</td>
</tr>
<tr>
<td></td>
<td>Range (Min, Max)</td>
<td>16.0 (76.0, 92.0)</td>
<td>5.0 (94.0, 99.0)</td>
<td>17.0 (76.0, 93.0)</td>
</tr>
<tr>
<td></td>
<td>P value</td>
<td>&lt; 0.0001</td>
<td>&lt; 0.0001</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Heart rate (BPM)</td>
<td>Mean (SD)</td>
<td>130.93 (9.76)</td>
<td>132.14 (6.82)</td>
<td>134.22 (8.50)</td>
</tr>
<tr>
<td></td>
<td>Range (Min, Max)</td>
<td>58.0 (110.0, 168.0)</td>
<td>48.0 (112.0, 160.0)</td>
<td>44.0 (118.0, 170.0)</td>
</tr>
<tr>
<td></td>
<td>P value</td>
<td>&lt; 0.017</td>
<td>0.618</td>
<td>0.100</td>
</tr>
<tr>
<td>Respiration rate (per minute)</td>
<td>Mean (SD)</td>
<td>36.72 (6.14)</td>
<td>37.28 (4.75)</td>
<td>39.08 (5.66)</td>
</tr>
<tr>
<td></td>
<td>Range (Min, Max)</td>
<td>36.0 (24.0, 60.0)</td>
<td>30.0 (28.0, 58.0)</td>
<td>30.0 (26.0, 56.0)</td>
</tr>
<tr>
<td></td>
<td>P value</td>
<td>0.102</td>
<td>0.339</td>
<td>0.394</td>
</tr>
</tbody>
</table>

BPM Beats per minute, F Fahrenheit, KMC Kangaroo mother care, SD Standard deviation

Improvement in oxygen saturation:
During KMC in the hospital (Group A), we observed that the mean oxygen saturation before KMC on day 1, day 2 and day 3 was 86.48, 90.71 and 90.77 and after KMC it was 89.64, 91.36, and 91.28 respectively ($p = 0.001$) as shown in (Table 2). Whereas, during KMC at home (Group B), before KMC it was 86.69, 90.76, and 88.50 on day 4, day 5, and day 6th and after KMC it was 97.55, 96.47, and 97.17 respectively ($p = 0.0001$) as shown in (Table 3). So, we analyzed that there was a similar but statistically significant improvement in oxygen saturation in group B.

**Improvement in heart rate:**

When we analyzed the stability in heart rate in group A, we observed that the mean heart rate before KMC on day 1, on day 2 and day 3, was 125.88, 132.69, and 136.23 and after KMC it was 126.86, 133.64, and 136.19 respectively. Whereas, in group B before KMC mean heart rate was 130.93, 134.22, and 134.77 and after KMC it was 132.14, 134.10, and 135.40 on day 4, day 5, and day 6 respectively. So, it was seen that in group A on day 1st and 2nd, KMC was statistically significant ($p = < 0.001$) as shown in (Table 2), while in Group B only on day 1st it was significant ($p = 0.017$), and on day 2 and day 3 it was statistically non-significant ($p = >0.05$) as shown in (Table 3).

**Improvement in respiratory rate:**

When we analyzed the stability in the respiratory rate in group A, we found that the mean respiratory rate after KMC on day 1 showed a slightly significant change whereas on day 2 and day 3 it did not show any changes as shown in (Table 2). However, in group B the mean respiratory rate after KMC on day 4, day 5, and day 6th, we did not find any significant changes as shown in (Table 3).

So, during the overall comparison of average improvement of vital parameters, we found that Kangaroo Mother Care, which was given at home setup (Group B) has a similar but statistically significant contribution to Improvement in vital parameters, especially concerning temperature and oxygen saturation as shown in (Table 4).
Table 4
Observation of improvement in average of four vital parameters in hospital setup and home setup separately with respect to before KMC and after KMC

<table>
<thead>
<tr>
<th>Physiological parameters (n = 156)</th>
<th>Statistics</th>
<th>BKMC</th>
<th>AKMC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hospital</td>
<td>Home</td>
<td>Hospital</td>
</tr>
<tr>
<td>Avg. Temperature (F)</td>
<td>Mean (SD)</td>
<td>95.57(0.52)</td>
<td>95.95(0.42)</td>
</tr>
<tr>
<td></td>
<td>P value</td>
<td>&lt; 0.0001</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Avg. O₂ Saturation</td>
<td>Mean (SD)</td>
<td>88.98 (2.44)</td>
<td>87.64 (2.29)</td>
</tr>
<tr>
<td></td>
<td>P value</td>
<td>0.015</td>
<td>&lt; 0.0001</td>
</tr>
<tr>
<td>Avg. Heart rate (BPM)</td>
<td>Mean (SD)</td>
<td>131.50 (8.08)</td>
<td>133.30 (7.30)</td>
</tr>
<tr>
<td></td>
<td>P value</td>
<td>0.0060</td>
<td>0.029</td>
</tr>
<tr>
<td>Avg. Respiration rate (per minute)</td>
<td>Mean (SD)</td>
<td>37.81 (5.22)</td>
<td>38.55 (5.06)</td>
</tr>
<tr>
<td></td>
<td>P value</td>
<td>0.047</td>
<td>0.035</td>
</tr>
</tbody>
</table>

BPM Beats per minutes, F Fahrenheit, BKMC Before Kangaroo mother care, AKMC After Kangaroo mother care, SD Standard deviation

DISCUSSION

In this observational study, we observed that there was a significant improvement in temperature in LBW babies when KMC was given at home (p < 0.0001). We could not find any study which was done on residents of mothers or attendees (at home) and in secondary care with level 1 NICU facility, coal mines hospital. But we found similar types of studies done in tertiary care hospitals by Pramila Verma et al. and they concluded that after KMC there was a mean rise in temperature from 96.69 ± 2.45°F to 98.07 ± 0.41°F which was statistically significant (p = < 0.001) [11]. Ludington-Hue SM et al. observed in their randomized controlled trial study that after KMC mean temperature remained within clinically acceptable ranges which was statistically significant [12]. Another study was done by Parmar VR et al. in Chandigarh India, and they observed that the body temperature rose from 97.02 ± 0.19°F to 98.93 ± 0.25°F after the KMC session which was highly significant statistically (p < 0.0001) which was concurrent to our study [13].

In our study just like the improvement in temperature we also found a statistically significant improvement in oxygen saturation when KMC was given at home (Group B). This sort of improvement in oxygen saturation was also observed in a quasi-experimental study which was done with 100 LBW
newborns by Parisa Parsa et al and they observed that there was a significant improvement of oxygen saturation after KMC ($p < 0.0001$) which was similar to our study [14]. Similarly, Ranjan A et al observed in their observational study that there was a significant improvement in oxygen saturation after KMC ($p < 0.001$), which is matching with our result [15].

In most of the studies, the stability in heart rate after KMC has been observed in a tertiary care center and they found significant stability in heart rate after 2nd hour of KMC session. A comparative study randomized controlled trial was performed by Sahbaei Roy et al. with 60 LBW newborn babies of 1.5 to $\leq 2.0$ kg of weight and has been found to have a statistically significant improvement in the heart rate ($p < 0.05$) [16]. Alpanamayi Bera, et al. reported that the heart rate significantly rises during KMC, and the mean changes were modest but statistically significant on all 3 days ($p < 0.05$) [17]. Our study has seen similar type of results.

In our study, we found a statistically non-significant stability in respiratory rate after the KMC session in group B when it was given on the 4th, 5th, and 6th days. But the statistically significant result was seen on day 1 and day 2 in group A when KMC was given in the hospital. A. Bera et al. during their observation of babies undergoing KMC of 1.5-$\leq 2.0$ kg observed a similar type of result [18]. Kadam S et al. had proven in their observation that there was significant stability in respiratory rates in babies weighing 1.5 to 2 Kg (36.2 v/s 40.7 ($p < 0.05$) [19].

No significant difference was found in improvement in heart rate and respiratory rate between group A and group B, but we observed similar but statistically significant improvement in temperature and oxygen saturation in group B (KMC at-home setup).

Statistically significant improvement in vital parameters at home setup might be due to family support (especially mums of KMC mothers), social support and empowerment, getting a good environment of privacy, getting more- time during KMC, nutritious home-made food, and lastly our effort to deliver consistent training and promoting to mother and family members after visiting at home during KMC session [20].

The strength of this study is that it is one of the observational studies which was done in the community and in secondary care coal mines hospital, especially in a rural area in the Indian scenario.

However, in this study, there were some limitations. The major limitation of this study was to comparison of vital parameters at home setup and in hospital setup at a different day. The vital parameters of a newborn would be different on day 1 compared to day 4 due to transition physiology. It was a community based prospective observational study rather than a randomized controlled trial. Even after the continuous counselling and training session, KMC could not be given correctly and hence such mothers had to be excluded from our study. This study was conducted in a single secondary care hospital and single community setting giving rise to berksonian bias. Our sample size was small and therefore this type of study needs more sample sizes for better analysis and results.
CONCLUSION

Despite these limitation, Kangaroo Mother Care, which was given at home, has a similar but statistically significant improvement of vital parameters especially concerning in temperature and oxygen saturation. Therefore, KMC helps to stabilize the vital parameters in both hospital and home setting. Our study supports the use of KMC at home in LBW infants mainly in resource-limited coal mines and rural community in world. If babies in the weight range of 1500 to <2000 gm are healthy, well-breast fed, and have no other risk factors can be discharged early and managed at home by delivering supportive care, nursing care along with Kangaroo Mother Care with continuous follow up.

Abbreviations

LBW     Low Birth Weight
LSCS    Lower Segment Caesarean Section
BPM     Beats per minutes
F       Fahrenheit
KMC     Kangaroo mother care
SD      Standard deviation.
BKMC    Before Kangaroo mother care
AKMC    After Kangaroo mother care

Declarations

Ethics approval and consent to participate: The study was approved by Tata Central Hospital’s ethics committee No- WBD/HA-MED/49/1329/2019, dated November 14, 2019. All participant mother signed the informed consent. A statement to confirm that all methods were performed in accordance with the ethical standards as laid down in the Declaration of Helsinki and its later amendment or comparable ethical standards.

Consent for publication: Not competent

Availability of data and materials: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests: The author declare that they have no competing interest.

Funding: None
**Author contributions:** TP contributed to concept, design, data collection, statistical analysis, preparation of manuscripts; AKR contributed to data analysis, concepts, preparation of manuscripts. All authors have read and agreed to the published version of manuscript.

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**References**


