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### RESEARCH ARTICLE

#### A NEW MHEALTH SOLUTION TO IMPROVE POST PARTUM QUALITY OF LIFE «QOL» FOR MOROCCAN WOMEN: A PILOT PROJECT IN MOROCCO

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#### Abstract

The post partum period also called the puerperium or the fourth trimester is the period following the delivery of the child. It encompasses the 12 weeks after delivery. During this period, mothers face many challenges due to the need of physical recovery from hormonal and physiological changes. The absence of appropriate and timely postnatal care during this period have dire consequences on both mothers and newborns. Many studies have documented that the use of postnatal care, which has a high prospect for reducing maternal morbidity and mortality, is still suboptimal in Low and Middle income countries such as Morocco. Women's attendance to post partum care visits is low to none in these countries. To improve the quality of post natal care in Morocco, and the quality of life « QOL » of our patients, les Orangers maternity hospital collaborated with the software research team of ENSIAS ( national school of computer science) in Rabat in this pilot project to create a post partum QOL based mobile solution( **Mamma&Baby app**) to help empower and support women in this critical period in their lives, and consequently reduce the mortality and morbidity rates in this patient's category.

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#### Introduction:-

The post partum period also called the puerperium or the fourth trimester is the period following the delivery of the child. It encompasses the 12 weeks after delivery. (1)

It is divided into Immediate puerperium (1-10 days postpartum), late puerperium (from the 11<sup>th</sup> to the 45<sup>th</sup> day) and remote puerperium (after 45 days) (1)

During this period, mothers face many challenges due to the need of physical recovery, hormonal and physiological changes, sleep disruption, learning new practices such as breastfeeding and newborn care especially for primiparas, sexual problems, contraception challenges, and the loss of family and professional balance. Ideally this type of care should be tailored to each patient's needs, medical history, socio-economic and cultural background. (1,2)

It is a critical and delicate time for both mothers and newborns, where high rates of morbidity and mortality are reported (2,3). The absence of appropriate and timely postnatal care during this period have dire consequences on both mother and child. The most frequently reported complications are: Postpartum hemorrhage, Endometritis,

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Thromboembolic accidents, Complications of hypertensive disorders, Gestational diabetes mellitus, Thyroid disorders, and Postpartum depression. (1)

Neonates face higher mortality rates and longer stays in the neonatal intensive care units.(3)

Consequently, the World Health Organization (WHO) recommended 3 healthcare visits on Day 3, Day 7 to Day 14, and at six weeks to evaluate women's health and medical conditions.

Many studies have documented that the use of postnatal care, which has a high prospect for reducing maternal morbidity and mortality, is still suboptimal in Low and Middle income countries (LMICs) such as Morocco (3,4). Women's attendance to post partum care visits is low to none in these countries.

Barriers to post partum care have been described in many studies such as living away from health care facilities, lack of transport, increased household charges, lack of time, mother's fatigue during the first 3 months and the idea that the delivery was the end point of their pregnancy and all of their health problems (5). The only physician the new mothers are willing to see is the paediatrician for their babies appointments.

In our Maternity hospital, women are monitored after delivery for 24H in the vaginal delivery group and 72H in the c section group. During their stay, they receive information and guidance from midwives and nurses about breastfeeding, self care, contraception, mood dysregulations, exercise and appropriate diet.

Patients who presented with hypertensive disorders, diabetes, autoimmune and thyroid issues are monitored more closely for complications. All neonates are examined daily and a paediatrician visit is scheduled if needed.

All women are scheduled for a post partum visit 3 days after discharge, to evaluate their general health and well-being, detect late complications and offer psychological support and effective contraception.

To my knowledge, up to this day, no research studies on the subject of «post partum healthcare improvement» or mHealth solutions for postpartum care» were conducted in Morocco.

Our purpose in initiating this study was to help women adjust to their new role as a mother and to help improve their post natal quality of life «QOL», while adding a new tool to the arsenal of mHealth solutions available to support women in the perinatal period.

**The post partum QOL as a tool for healthcare research:**

QOL is a well known concept, used in many specialities. It refers to an individual's perception of life based on the existing cultural conditions, values, attitudes, goals, and standards. The World Health Organisation describes six main components of QOL: physical health, psycho-emotional status, level of independence, social relationships, spiritual beliefs, and environmental status. This definition embraces the subjective aspects of the QOL concept which is a multidimensional construct used in health care research with physical, psychological, and social dimensions.(6,7)

**mHealth technology for post partum care improvement:**

In the last decade, smartphones industry has know a rapid development, since mobile phones have become a necessity in human life. Globally, the use of mobile technology to achieve health goals has changed the approach of health care delivery services . Studies have shown that the deployment of mobile health (mHealth) interventions has the potential of improving the uptake of postnatal care services. However, the effectiveness of such measures depends mainly on its acceptance by the intended end users, that is, the new mothers. (8,9)

Mobile health technology was being introduced in the past years as a complement to the traditional healthcare practice. The end goal was to help healthcare providers communicate remotely with their patients, do a better triage of the cases and decrease the patients numbers during consults which would improve the quality of each doctor-patient interactions. Many health based mobile applications were created to provide new and efficient interventions to help in women's empowerment and engagement in their healthcare and to improve their health literacy. (9)

To improve the quality of our post natal care, and the quality of life « QOL» of our patients, les Orangers Maternity Hospital collaborated with the software research team of ENSIAS (national school of computer science) in Rabat in a pilot project to create a QOL based mobile solution to help empower and support women in this critical period of their lives.

## **Methods:-**

### **First phase of the study:**

Assessing Moroccan women's needs and quality of life in the post partum period

We conducted a prospective study, from March 19<sup>th</sup>, to April 20<sup>th</sup> 2019, to evaluate our population's needs and assess their engagement in their healthcare. We offered the opportunity to participate to all women admitted to the post partum ward during the study period. We explained that our purpose was to improve their quality of life, and to speed their recovery after birth.

### **Consents were obtained from all participants.**

We used mixed methodology qualitative and quantitative to get feedback from women participating in our study. We used a questionnaire modelled on the «**MGI**» **mother generated index** for post natal quality of life evaluation (**Fig 1**), it was translated in Arabic, with simplified wording. We asked women with low level of literacy all the questions directly.

Our aim was to measure mothers' perceptions of QOL after delivery and to identify the perceived areas of their lives that were affected after childbirth.

The questionnaire was divided into three steps: in the First step, we asked the women to identify up to eight life areas that changed after the birth of their child. In the second step they had to evaluate if the change is positive, negative or both, then they had to use a scale of numbers, where 0 is the worst possible and 10 is the best possible, to assess the given life areas. In the third step, the participants needed to allocate points according to the importance of the changes they felt in each area of their life. There was a maximum of 20 points, which could be allocated to the most important areas.

The interviews were conducted using the questionnaire on day 3 and day 30, to assess the impact of the time factor on new mothers' perception of the post partum QOL.

Based on these results we chose the features we included in our post partum mobile app, that was created thanks to the collaboration between our obstetrical team and the software research team of the national institute of computer science ENSIAS, in Rabat, to help support women after their discharge from our maternity, reinforce their health seeking behaviour and improve their attendance to scheduled post natal care visits. (**Table 1**)

THE MOTHER-GENERATED INDEX © Step 1: Identifying areas		A QUALITY OF LIFE ASSESSMENT Step 2: Scoring each area		Step 3: Allocating points
<p>We would like you to think of the most important areas of your life that have been affected by having a baby. These can be POSITIVE or NEGATIVE, or perhaps BOTH, or Neither really one nor the other. Please write up to eight areas in the boxes below, and indicate if you think the area is positive, negative, or neither of these.</p> <p>Examples other mothers have given are:</p> <ul style="list-style-type: none"> <li>• How they feel about themselves</li> <li>• How they feel about their baby</li> <li>• How their feel about their relationship with their partner or other family members</li> <li>• Physical or emotional issues (good or bad)</li> <li>• How they feel about going back to work</li> <li>• How they feel about their social life</li> </ul> <p>These are only examples. We want you to say what you feel.</p>		<p>Now please score the areas you mentioned in Step 1. This score should reflect how you have been affected by this area over the past MONTH.</p> <p>Please place a cross along the line in each case: 0 is the worst - you couldn't feel any worse than this 10 is the best - you couldn't feel any better than this</p> <p>Worst <span style="float:right">Best</span></p> <p>0 1 2 3 4 5 6 7 8 9 10</p>		<p>Please think how important these areas are to your quality of life. You have 20 points to allocate. You don't have to allocate points to an item if you don't want to. Give more points to the areas you think are most important.</p> <p>Write the points in the boxes below.</p>
	Positive Negative Both / Neither	0 1 2 3 4 5 6 7 8 9 10		
	Positive Negative Both / Neither	0 1 2 3 4 5 6 7 8 9 10		
	Positive Negative Both / Neither	0 1 2 3 4 5 6 7 8 9 10		
	Positive Negative Both / Neither	0 1 2 3 4 5 6 7 8 9 10		
	Positive Negative Both / Neither	0 1 2 3 4 5 6 7 8 9 10		
	Positive Negative Both / Neither	0 1 2 3 4 5 6 7 8 9 10		
	Positive Negative Both / Neither	0 1 2 3 4 5 6 7 8 9 10		
	Positive Negative Both / Neither	0 1 2 3 4 5 6 7 8 9 10		

Remember: points in Step 3 must add up to 20

Fig 1:- Mother Generated Index questionnaire; Source: Symon A, MacDonald A, Ruta D. Postnatal Quality of Life Assessment: Introducing the Mother Generated Index. Birth 2002;29:40 6.

**Results:-**

During our study period, from March 19<sup>th</sup>, to April 20<sup>th</sup> 2019, 180 women were admitted to the postnatal ward, in Les Orangers Maternity Hospital. 140 of them declared having an android phone, but only 112 women accepted to participate to the interviews we conducted, and gave us their consents to the study.

The epidemiological characteristics of the participants were as follows: Age interval between 26 and 32. Marital status: 90 women were married, and 22 were unmarried (in a relationship or single). Gestational status: 89 primiparas and 23 multiparas. Mode of delivery: 45 c-sections and 67 vaginal deliveries. Educational level: 23 had a middle school certificate, 59 women had a high school certificate and 30 had a college degree. They all used mobile phones for oral and written communications, 89 women had social media accounts, and 43 declared having a health related app on their smartphone ( 12 for steps counting, 8 for diet, 12 for gestational age, 11 for sleep evaluation)

We conducted our evaluation using the questionnaires on day 3 ( during the post natal visit) and on day 30 (late puerperium), our purpose was to evaluate the difference in patients' perception of their quality of life domains in the early post partum period (Day 3) compared to Day 30, after a period of recovery and adaptation.

After analysing the collected data from the questionnaires, we found that the life domains that were the most affected in the early post partum period were: (Table 1)

**Sleep quality:**

97% reported an alteration in their sleep quality.

**Mental health:**

84% of the participants reported stress, fatigue and an alteration of their self image (They didn't feel like themselves, and didn't like their bodies)

We evaluated their Depression risk on day 3 using the Edinburgh Postnatal Depression Scale (EPDS), only 8 patients had high scores, and were referred to psychology consult.

**Breastfeeding and child care:**

83% of women reported having difficulties feeding and taking care of their newborns .

**Lack of support:**

From their families (80%), living in remote areas, and their partners (79%) who were either working, in the military (weren't granted permission), in another country or simply busy taking care of their other children at home.

70% of the participants felt an important **physical pain and discomfort** after delivery, with scores between 7 and 9 on the visual analogue scale. 61% of them were in the c section group.

53% of the participants didn't feel confident in their new role as a mother.

On day 30 after delivery, only 54 women accepted to participate in the second round of interviews out of 112. The other participants didn't answer our calls. We conducted the same interviews as Day 3, using the modified QOL evaluation questionnaire (MGI)

The participants reported that **Sleep quality and Mental health** were still the most affected life domains ( 92% and 90%), and were still feeling a **Lack of support**: From their family (83%), and partners (72%). The new mothers felt more confident about **breastfeeding and baby care**, only 55% still felt some difficulties.

**Table 1:-** The most affected areas reported by the participants during the post natal period.

Most impacted life areas	Day 3	Day 30
Sleep quality	109/112 ( 97%)	50/54 ( 92%)
Mental health ( Stress ,Fatigue and low esteem)	95/112 ( 84%)	49/54 ( 90%)
Breastfeeding and child care	93/112 ( 83%)	30/54 ( 55%)
Lack of family support	90/112 (80%)	45/54 (83%)
Less time with partners and friends	89/112 ( 79%)	39/54 ( 72%)
Physical pain and discomfort	79/112 (70.5%)	10/54 ( 18.5%)
Body Image	70/112 ( 62%)	23/54 (42%)
Aptitude as a mother	60/112 ( 53.5%)	15/54 ( 27,7%)

**A Walk through our mobile application Mama&baby: (21)**

The most relevant areas that stood out in this study, and thus were featured in our mobile app were: sleep quality, mental health, breastfeeding and baby care, body image and physiological changes. Lastly, family and community support. ( **Table 2**)

This mobile app was created thanks to the collaboration between our obstetrical team and the software research team of the national institute of computer science ENSIAS, in Rabat as part of a Partnership For Enhanced Engagement in Research «**PEER project 7-246**» (21)

This mobile app can be downloaded for free on playStore, it was designed for android mobiles, and supports 3 languages: Arabic, French, and English.

It encompasses the six domains our study population deemed necessary for their well being in the post partum period.

To access the app, the woman needs to Login, enter her baby's name, date of birth and gender. The first domain approved for post partum QOL improvement was Breastfeeding and baby's well-being. It was featured in Mama and Baby app. Every mother can track her baby's breastfeeding ( duration and frequency), or the quantity of baby formula and type of baby food for infants. She can also track her baby's diaper changes ( Frequency, quality of the stool) to look for diarrhea or constipation which constitute alarming signs. The mother can also follow her baby's growth chart ( height, weight and head circumference). The application provides red flag in case of growth delay so that the mother can consult with a paediatrician for further investigations. The app offers the possibility of sleep tracking for the mother and her baby to evaluate their sleep quality and duration in order to find ways to improve it.

A Calender with a reminder option was included to schedule and track all the mother's and her baby's medical appointments. The app also offers guidance for weight loss and physical recuperation ( Diet and exercise guides are provided).

Mental health was one the highest rated areas in our study, we incorporated the Edinburgh Postnatal Depression Scale in the app to assess the mother's mood modifications in the weeks following delivery and assess the need for further psychological support.

And finally, to get social support, mothers using the app communicate, get support from each other, and share their experiences in the community forum.

The rate of attendance of the postnatal visit in our facility is usually low around 30%. It was improved in our study population 60/112 (53%), the participants reported feeling supported and well cared for by the medical team, who were asking them regularly about their health and feelings , they also felt self empowered and more autonomous evaluating their improvements in the main QOL domains (breastfeeding,child care, sleep quality, and fatigue). They reported an appreciation of the companionship they had with their fellow participants, which was a source of motivation and help.





**Table 2:-** Screenshots of Mamma&Baby App's contents.

### **Discussion:-**

The postpartum period, or puerperium, starts one hour after delivery and ends six weeks after birth as it was believed that women's body returns to its non-pregnant state.

This period is characterized by several physical and mental health changes, that impact the new mothers quality of life (QOL). QOL is an important category of patient-reported outcomes, in which the patient's perspective is key, it can be used to assess the impact of the patient's current health status to orient the efficiency of medical interventions. QOL also incorporates the patients' evaluation of their functioning, and their satisfaction in every key period of their lives.

According to the last National Survey on Population and Family Health in Morocco, only 22% of women attend their scheduled postnatal visit. In our maternity hospital we report 30% of attendance rate despite all efforts (visits that were free of charge, explanations offered about the importance of postnatal visits to prevent and detect postpartum complications, patient-tailored contraceptive methods provided for free, psychological evaluations and support, diet and exercise plans offered by our dietician, and pelvic rehabilitation for the vaginal delivery and instrumentation group.

To further our efforts, we worked with the software research team of the national school for computer science (ENSIAS) in Rabat, on this research project to offer a digital solution to help our population face the challenges impacting their QOL after delivering their babies.

In the first phase of our study we identified the life domains that were the most affected in the post partum period:

**1/Sleep quality and Mental health** were equally deemed to be the most disturbed areas by our participants. There is a close association between these two domains. Many studies showed that poor sleep was related to post-partum depression since lack of sleep can result in exhaustion, impatience, lower ability to concentrate, and a poor quality of

life (QOL), which can all contribute to an increased risk for postpartum depression especially in high risk patients (14,15). Poor sleep is a diagnostic criteria for depression based on the DSM-V (American Psychiatric Association) (11)

**2/ Breastfeeding and childcare difficulties:** Problems with setting up breastfeeding and childcare for the newborn are quite common. The main reasons brought up by the mothers (mostly primiparas) were the post partum fatigue, inexperience, and the suboptimal infant breastfeeding behaviour (SIBB) (12,13)

**3/Limited Family support:** Women face multiple difficulties after delivering their babies: hormones imbalance, difficulties taking care of their newborns (breastfeeding, diaper change..), poor sleep, fatigue, baby blues and depression. They need their families and partners support to go through this difficult period of their lives (17,18). Our participants reported a feeling of loneliness ( family living in other cities, partners who are working..) and a lack of emotional, physical and financial support from their loved ones.

Lack of postnatal family support, especially the support from the husband, was reported in many studies as an important risk factor of post partum depression ( 17).

Xie and Al conducted a prospective cohort study including 534 women, to assess the association of family support with post partum depression (PPD), they concluded that the lack of support from family was an important risk factor for post partum depression.(10)

Our participants reported other areas that were affected in the postnatal period such as: their social life that was put on hold, their body, feeling pain and discomfort with a negative body perception, they all expressed the need to recover their pre pregnancy shape and health. Some participants (53%) didn't feel confident in their new role as mothers.

We contacted the participants on day 30 after delivery by phone calls, to assess their perceptions of the post partum QOL after a time of recovery and adaptation. Only 54 participants answered our questions ( based on a modified version of the Mother generated index questionnaire) and were willing to give us their feedback. They reported that Sleep quality and Mental health represented the major issue for them, followed by a feeling of loneliness because of the lack of family support, their partner's absence during work hours and their restricted social life because of their new lifestyle.

Breastfeeding and child care was still an important area that is impacting their quality of life, but they felt more confident in taking care of their child.

This study served to orient the content of our digital solution, a mobile application for post partum healthcare support «**Mamma&Baby**».

In the light of these results, sleep quality and mental health care improvement were the main app features. By recording their baby's sleep times, the new mothers would be able to adapt their sleep and their schedule around it, seek help and support from family and friends to get periods of relaxation and rest. For mental health, the 10-question Edinburgh Postnatal Depression Scale (EPDS) was included in the app, so that each woman could self assess her mental state in search for signs of baby blues or depression. Depression symptoms are often ignored by new mothers and labelled as simple fatigue and exhaustion. We believe that including an evidence-based assessment tool such as the EPDS would be of a great help to the mothers, who would be able to seek professional help in time. For Baby blues the app offers some behavioural and cognitive coping strategies, that may help alleviate the feeling of sadness. The third feature is for breastfeeding and childcare. Our participants expressed difficulties in maintaining Breastfeeding that was initiated immediately after birth in our facility, this feature was included in our prototype to help track the frequency, duration and quantity of each meal. Alarms would set off if the breastfeeding is deemed insufficient compared to norms. For childcare, the app offers the possibility to track diaper changes (frequency, quantity and quality of the stool) to look for any digestive problems, to record the baby's measurements ( weight, height and head circumference) and compare them to the growth charts. All paediatrics appointments (vaccines, checkups) can be recorded on the calendar and reminders can be set. We also included several guides about childcare and a « frequently asked questions section» to help mothers calm their worries.

The last category of QOL that was impacted in our participants life was their Support system. Because of the distanciation from their families, the partner's job or other personal circumstances, the new mothers felt de-



socialized and lonely which is harmful for their adaptation to their new life. We included a community forum, where users of the Mamma&Baby app could communicate, exchange information and support each other. mHealth solutions opened a whole new world to patients of all categories and their healthcare providers. It offers many opportunities for healthcare systems development.

Through this research, we tried to participate to the global effort to improve the medical practice, To my knowledge, it is a unique study in Morocco that resulted in a new digital solution adapted to Moroccan women's culture, health literacy and expressed needs.

#### **Study limitations and Futur work:**

Our study is prospective study, conducted in one center, Les Orangers maternity Hospital in Rabat, with a limited number of patients (112), which is an obstacle to the generalizability.

We intend to conduct a multi-centric cohort study, with participants from different backgrounds to assess the usefulness and degree of satisfaction of our postnatal mobile solution.

#### **Conclusion:-**

Women's Quality of life evaluation is an important component that healthcare providers need to incorporate in their practice. The post partum period is a very important time to educate and accompany new mothers who face many health and mental challenges. Low and middle income countries need to put more efforts in the post partum healthcare to lower women and newborns' mortality and morbidity rates. mHealth technologies have proven time and again to be of a great worth in Obstetrics, making the patient a full partner to the physician. We believe that this new approach of the Patient-Partner is the futur of our medical practice.

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