

"Navigating the Digital Realm: An In-Depth Analysis of Pregnancy Apps for Maternal Health and Nutrition"

ABSTRACT

Due to the rise in nuclear families, many pregnant women utilize mobile applications to get information about pregnancy, labour, and postpartum care. The development of a baby takes nine months from egg to zygote to embryo to fetus to newborn (nine months to be precise). Whatever happens during this period before birth, determines what he is going to be like at the time of birth as well as in later life. Pregnancy is therefore of the utmost significance. Aim of the study was to analyze the already existing pregnancy apps for their content and quality provided on health care during pregnancy and proper nutrition care during prenatal period. To analyze these pregnancy apps, 40 apps available on Google Play Store were downloaded and installed on an Android phone. Each and every app is critically assessed by the investigator for its content and quality based on different criteria using self-structured schedule. Majority of the apps available on play store lacked crucial information related to health care and nutrition during pregnancy. However, it was determined that the material which was available was found accurate and relevant but insufficient. Women are increasingly using mobile apps to access information about pregnancy. There are several pregnancy apps available, however they do not meet the needs of Indian mothers who are expecting. These apps offer information, but it is sparse and difficult to understand. Therefore, it is necessary to create a pregnancy app specifically for Indian mothers that offers adequate information in Hindi and regional dialects.

Keywords: Analysis, Apps, Health, Indian mothers and Pregnancy

1. Introduction

A new life begins much before a child is born. The ovum fertilized by sperm develops inside a woman's uterus. This period of prenatal development is known as pregnancy. To ensure the baby's health and wellbeing, the would-be mother must properly care for herself. The mother should be aware of the many changes taking place in her body during pregnancy and how these changes affect the requirements for diet, exercise, rest, clothes, and other factors. She should be informed of numerous norms, warning signs, and dos and don'ts so that she can act appropriately and promptly. Unfortunately, women lack basic understanding about a number of crucial elements of pregnancy, especially first-time mothers. According to Downs *et al.* (2014) and Lundsberg *et al.* (2014), young women have poor knowledge about conception, fertility, the ovulation cycle, and gestational weight. Studies have also shown that pregnant women frequently lack nutrition information and continue to eat items that put them at risk (Bryant *et al.*,

2017). Their understanding of aspects related to maternal health is also insufficient (Mbada et al., 2014; Williams et al., 2016).

Poor information results in improper habits, which has an adverse effect on both the mother's and the baby's health, including nutritional deficiencies, low birth weight, birth difficulties, growth retardation, infant and maternal death, etc. A good understanding of pregnancy contributes to the health and wellbeing of both mothers and their children (Chan & Chen, 2019). Therefore, it is ideal for a mother to have correct and sufficient understanding about all elements of pregnancy for the sake of both the mother and the child.

Young women receive a lot of common and essential information regarding prenatal care from their mothers and mothers-in-law. By sharing their pregnancy stories, they unconsciously and informally teach the younger generation of mothers. The nuclear family structure has replaced the joint family system. A large number of couples reside far from their relatives. As a result, the pregnant woman does not always have access to her mother-in-law's advice. Also, the current generation has greater trust in the internet and contemporary science than in traditional knowledge. Young mothers who are expecting therefore use media and digital technology to get necessary knowledge.

In today's world, smart phones are a need. Searching online has taken over our lives. For effective parenting, young parents are becoming more and more reliant on the internet and mobile devices. Since it allows mothers to connect with one another through apps, social media, the internet, etc., digital media has emerged as a key source of prenatal information for women (Lupton, 2017). It saves time, is simple to use, responds instantly, provides useful data at almost negligible cost. Apps have developed into a significant and practical information source for expectant women as the use of mobile phones increases daily (Lee & Moon, 2016). According to Wang *et al.* (2019), these pregnancy applications assist new mothers in learning about pregnancy, childbirth, and health information.

Despite the fact that there are a large number of pregnancy apps available to users, the majority of Indians do not find these apps to be very popular. The apps only offer an insufficient amount of information on a small number of pregnancy-related topics. Therefore, it is necessary to create an app for Indian mothers that offers comprehensive and reliable information related to pregnancy. The purpose to analyze already available pregnancy apps is to develop an app specially for Indian pregnant women to fulfill their needs. Study conducted by Yadav *et al.* (2023), also revealed that women felt strong need of knowledge regarding health care during pregnancy and nutrition.

2. Methodology

2.1 Preparation of Self-structured Schedule

This study was conducted on pregnancy apps available on Google Play Store. Initially, 40 pregnancy apps which were available for free download on Google Play Store were downloaded and installed on an android phone. These apps were assessed thoroughly for their content and quality to prepare the schedule

for the final analysis of these apps. A list of content was made which was available in already existing pregnancy apps. Based on the list of content, a self-structured schedule was prepared on health and nutrition aspects of pregnancy.

2.2 Sample Selection

To conduct a detailed study of analysis of pregnancy apps, a digital sample of 40 apps was selected for the study. These pregnancy apps were selected based on their availability for free download on Google play store. The selection of these apps consisted of various steps to have a representative sample for the study.

2.3 Inclusion Criteria

- Only those pregnancy apps were selected that were free to download from Google play store and have accessibility for all users.
- Apps specifically available for pregnant women providing information related to pregnancy aspects such as health during pregnancy, nutrition, pre-natal development and general pregnancy tips were included in the study.

2.4 Exclusion Criteria

- Apps that were paid or those requiring in-app purchases for some special features were excluded from the study.
- Apps that were not focused on pregnancy care aspects or focused specifically for infants, preschoolers etc. were completely excluded from the study.
- Some of the pregnancy apps on Google play store have very less ratings and insufficient user reviews were also not included in the study.

2.5 Data Analysis

App content and its quality in each app was thoroughly assessed by the researcher using self-structured schedule. For accomplishing the objectives, the information collected was categorized and calculated in order to make significant inferences. The results were interpreted using the descriptive statistics shown below:

- i. Frequency
- ii. Percentage

3. Results

3.1 Health care during pregnancy

Results regarding health of a pregnant women has been shown in Table 1. Majority of the existing apps had no information on various aspects such as health during pregnancy (85.0%), at what stage of pregnancy, a woman should consult with doctor (87.5%), remedies for common problems (87.5%), digestive problems (92.5%), diabetes (80.0%), medicines to avoid (92.5%), sex positions (87.5%) and

postnatal health (92.5%). Likewise, about three-fourth of the apps did not have information on common complaints during pregnancy (75.0%), constipation (75.0%), hemoglobin (77.5%), swelling in ankle and feet (75.0%), proper sleep (72.5%), travel during pregnancy (77.5%), avoid smoking and alcohol (72.5%), stretch mark prevention (75.0%) and pregnancy pains (70.0%) while rest of the apps provided information on these aspects.

Table 1 Availability of information on health care during pregnancy

N=40

Health aspects	Yes		No	
	F	%	F	%
Health during pregnancy	10	15.0	30	85.0
Stages of pregnancy to consult with doctor	05	12.5	35	87.5
Common complaints during pregnancy	10	25.0	30	75.0
Remedies for common problems	05	12.5	35	87.5
Digestive problems	03	07.5	37	92.5
Constipation	10	25.0	30	75.0
Diabetes	08	20.0	32	80.0
Haemoglobin (Hb)	09	22.5	31	77.5
Swelling in ankle and feet	10	25.0	30	75.0
Proper sleep	11	27.5	29	72.5
Travel during pregnancy	09	22.5	31	77.5
Medicines to avoid	03	07.5	37	92.5
Avoid smoking and alcohol	11	27.5	29	72.5
Stretch mark prevention	10	25.0	30	75.0
Pregnancy pains	12	30.0	28	70.0
Sex positions	05	12.5	35	87.5
Postnatal health	03	07.5	37	92.5

Fig. 1 Health Aspects (Case 1)

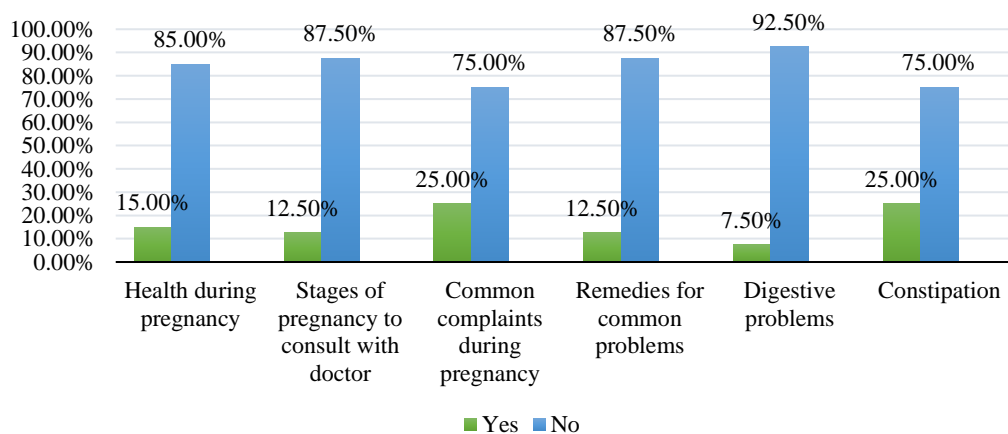


Fig. 2 Health Aspects (Case 2)

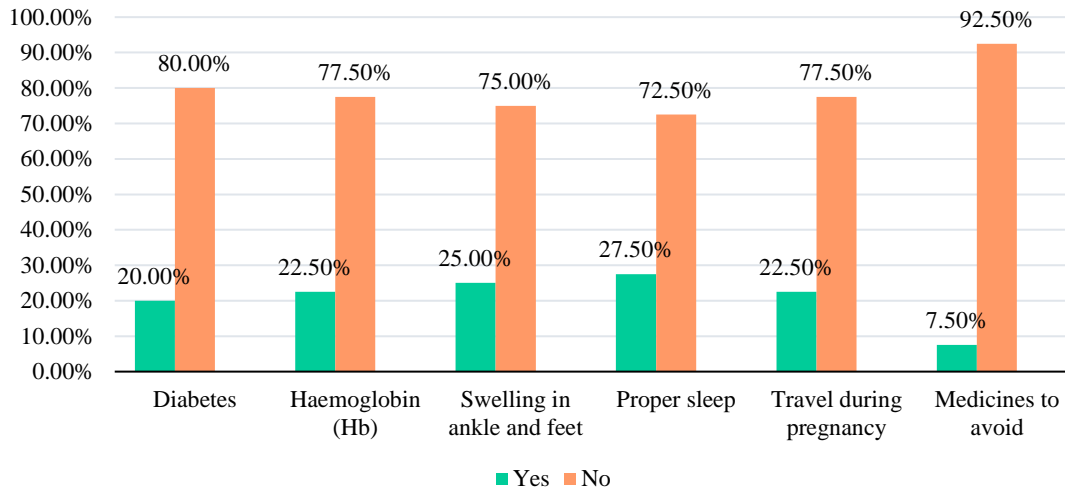
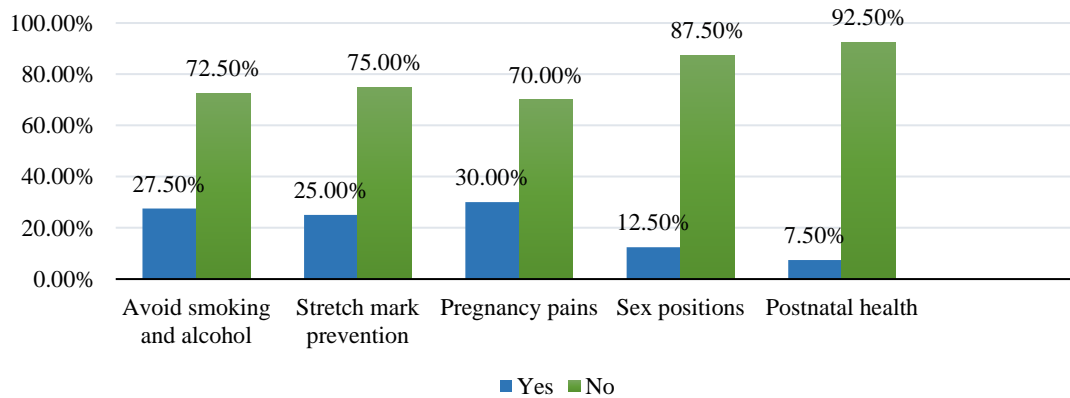


Fig. 3 Health Aspects (Case 3)



3.2 Nutrition during pregnancy

But most of the apps existing had no information on these aspects depicting that these apps were not fulfilling the needs of target users such as importance of water (80.0%), foods to improve baby's fairness (95.0%), weekly nutrition (90.0%), diet plans for all trimesters (85.0%) and post pregnancy diet plan (97.5%). About two-third of the apps did not have content on supplements (70.0%), foods to eat (65.0%), proper diet (67.5%) and diet tips for all trimesters (62.5%). Nearly half of the apps lacked information on nutrition & fitness (50.0%) and foods to avoid (52.5%) whereas remaining apps contained information on these aspects.

Table 2 Availability of information on nutrition during pregnancy

N=40

Nutritional aspects	Yes		No	
	F	%	F	%
Nutrition and fitness	20	50.0	20	50.0
Supplements	12	30.0	28	70.0
Importance of water	08	20.0	32	80.0

Foods to eat	14	35.0	26	65.0
Foods to avoid	19	47.5	21	52.5
Foods to improve baby's fairness	02	05.0	38	95.0
Proper diet	13	32.5	27	67.5
Weekly nutrition	04	10.0	36	90.0
Diet tips for all trimesters	15	37.5	25	62.5
Diet plans for all trimesters	06	15.0	34	85.0
Post pregnancy diet plan	01	02.5	39	97.5

Fig. 4 Nutrition Aspects (Case 1)

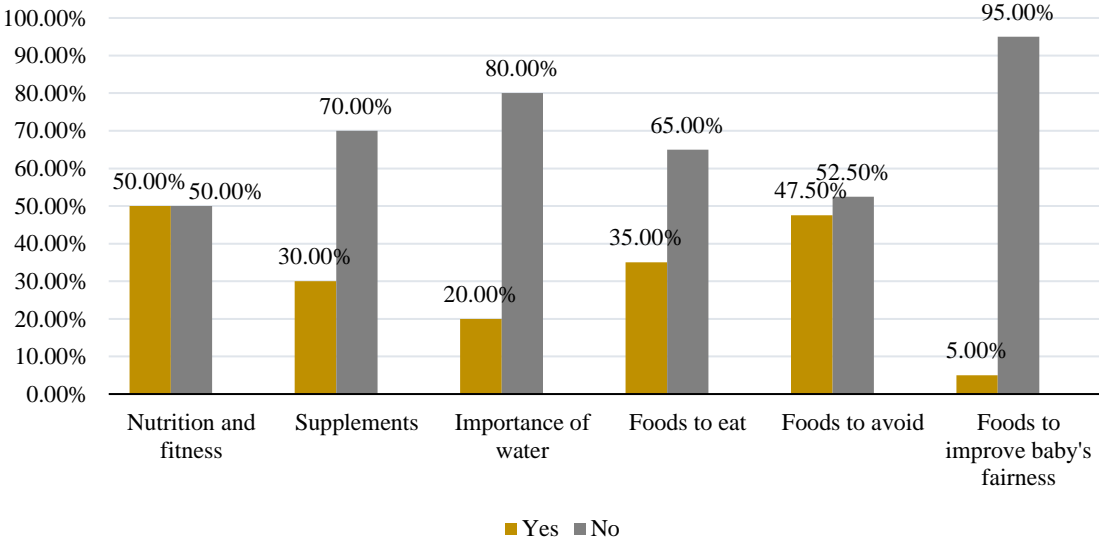
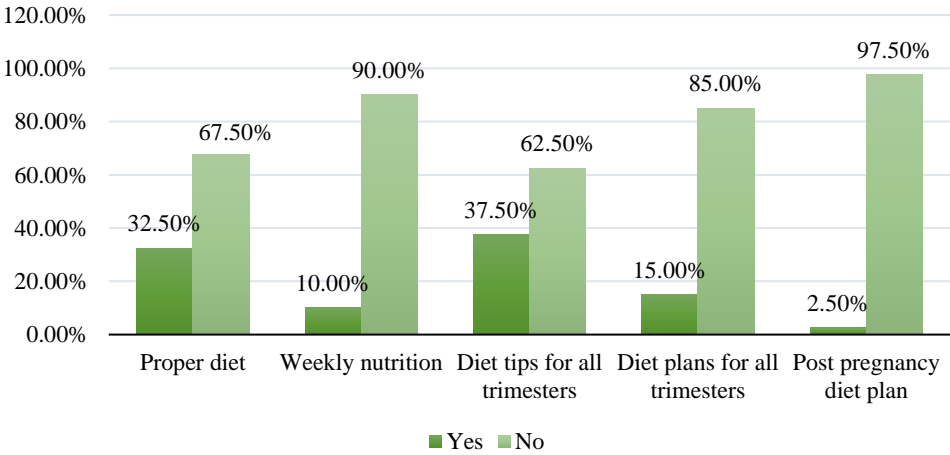


Fig. 5 Nutrition Aspects (Case 2)



4. Discussion

4.1 Pregnancy health care

In this study, it has been observed that majority of the apps that were already available lacked information on a number of health-related topics, including common complaints and how to address them, digestive issues, constipation and diarrhea, blood pressure, ankle and foot swelling, getting enough sleep and rest, travelling, stretch marks, medications to avoid, vaccinations, exercise, health checkups, hemoglobin, high/low blood pressure and postnatal health. Studies show that women don't know enough about maternal health issues (Kanu et al., 2014; Mbada et al., 2014; Williams et al., 2016). A study carried out by Samanta *et al.*, (2023) also revealed a strong need of knowledge about some health issues such as vaccination schedules, some digestive issues (constipation, diarrhea or bloating). According to research (Nasution & Hariyati, 2018), having more knowledge lowers the risk of maternal mortality and aids in coping with stress and anxiety (Rathbone & Prescott, 2017; Hantsoo et al., 2018). Overall current app offerings generally do not provide adequate maternal health information and are not optimally accessible to the target users in terms of inclusivity of women of color or app usability (Trucker et al., 2021). Therefore, a pregnancy app that addresses these health issues is required in regional languages which can provide credible information and should also provide source of information in the app.

4.2 Nutrition during pregnancy

This study identified an observable gap between the information already available in the apps and the felt needs of the Indian pregnant women. Findings of a study by Samanta et al., (2024a) also showed a clear discrepancy between already available information on digital platform and need of mothers for nutritional guidance. Pregnant women frequently continue to eat foods that put them at risk because they lack enough knowledge about nutrition (Bryant et al., 2017). Additionally, Shub *et al.*, (2013) found that women's knowledge of obesity, gestational weight gain (GWG), and its effects is lacking. Information about nutrition during pregnancy, including what to eat, what not to eat, when to eat, how much to eat, common deficiencies, and supplements, was also highly desired by the study's respondents (Yadav et al., 2023). However, the findings are consistent with the previous research conducted by Samanta *et al.*, (2024b) that majority of currently available apps lacked information on these points, indicating that they were failing to meet the demands of their intended users.

5. Conclusion

Women are increasingly using mobile apps to access information about pregnancy. There are several pregnancy apps available, however they do not meet the needs of Indian mothers who are expecting in terms of health and nutrition care. Health and Nutrition are the primary factors to be taken care of during pregnancy such as common complaints and how to address them, digestive issues, constipation and diarrhea, blood pressure, ankle and foot swelling, getting enough sleep and rest, travelling, stretch marks, medications to avoid, vaccinations, exercise, health checkups, hemoglobin, high/low blood pressure,

postnatal health, what to eat, what not to eat, when to eat, how much to eat, common deficiencies, and supplements. These apps offer information, but it is sparse and difficult to understand. The apps are primarily in English language. Therefore, it is necessary to create a pregnancy app specifically for Indian mothers that offers adequate information in Hindi and regional dialects.

Disclaimer (Artificial intelligence)

Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

6. References

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