# Development of an application prototype for mobile devices about pregnancy and syphilis in pregnancy as a health education strategy

## *Desenvolvimento de um protótipo de aplicação para dispositivos móveis sobre gravidez e sífilis na gestação como estratégia de educação em saúde*

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**ABSTRACT**

**Introduction:** Syphilis is a systemic sexually transmitted infection (STI) caused by the bacterium Treponema pallidum. It has chronic evolution and is subject to flare-ups and latency periods when untreated, which can produce the acquired or congenital forms of the disease. It has been acknowledged in 2016 as an epidemic in Brazil. **Objective:** To identify the information needs of pregnant women regarding syphilis during pregnancy and congenital syphilis, aiming to assist in the development of a technology-mediated educational resource as a strategy to promote health and fight the syphilis epidemic. **Methods:** The prior knowledge of pregnant women assisted in high-risk prenatal care at the Maternity of Divino Amor in Parnamirim/RN was investigated, in order to identify the information needs of this population and support the development of a prototype of an educational resource in prenatal care services that use technological mediation, education and communication as distance health education strategies. **Results:** Forty-six pregnant women who demonstrated to have gaps in knowledge about syphilis were assessed with regard to: signs and symptoms of the disease, prevention measures, and vertical transmission. **Conclusion:** These findings supported the development of a prototype educational resource that intends to be an important source of information for the adoption of preventive health measures, contributing to the learning process of pregnant women, to the improvement of health indicators in this population and the reduction of congenital syphilis cases.
**Keywords:** syphilis; health communication; education, distance; health education; prenatal care; health promotion.

**RESUMO**

**Introdução:** A sífilis é uma infecção sexualmente transmissível (IST) sistêmica causada pela bactéria Treponema pallidum, de evolução crônica, sujeita a surtos de agudização e períodos de latência quando não tratada, que pode produzir as formas adquirida ou congênita da doença. É reconhecida desde o ano de 2016 como epidêmica no Brasil. **Objetivo:** Identificar necessidades de informações que as gestantes apresentam em relação à sífilis na gestação e à sífilis congênita para auxiliar no desenvolvimento de um recurso educacional mediado por tecnologia como estratégia educacional para a promoção da saúde e o enfrentamento da epidemia de sífilis. **Métodos:** Investigou-se o conhecimento prévio das gestantes atendidas no pré-natal de alto risco da Maternidade do Divino Amor em Parnamirim/RN, para a identificação das necessidades de informação dessa população e o desenvolvimento de um protótipo de recurso educacional para a formação da gestantes atendidas no pré-natal, que utilize mediação tecnológica, a educação e comunicação como estratégias de educação em saúde a distância. **Resultados:** Foram investigadas 46 gestantes que demonstraram lacunas no conhecimento sobre a sífilis no que se refere a: sinais e sintomas da doença, medidas de prevenção e transmissão vertical. **Conclusão:** Esses achados subsidiaram a elaboração de protótipo de recurso educacional que pretende se constituir em importante fonte de informação para a adoção de medidas preventivas de saúde, contribuindo para o processo de aprendizagem das gestantes e para a melhoria dos indicadores de saúde nessa população e a redução dos casos de sífilis congênita.
**Palavras-chave:** sífilis; comunicação em saúde; educação à distância; educação em saúde; cuidado pré-natal; promoção da saúde.

## INTRODUCTION

Since 2016, Brazil has been facing an epidemic of syphilis, a systemic infectious sexually transmitted disease (STD) of chronic evolution, subject to flare-ups and latency periods when untreated. This disease is caused by the *Treponema pallidum*, a sexually or vertically transmitted spirochete bacterium, which can produce acquired forms (primary, secondary, recent latent, late latent and tertiary) or congenital forms of the disease, classified as recent (cases diagnosed until the 2nd year of life) or late (cases diagnosed after the 2nd year of life)[1].

The World Health Organization (WHO) estimates more than one million cases of sexually transmitted infections (STI) per day worldwide. Each year, approximately 357 million new cases are estimated, including chlamydia, gonorrhea, syphilis and trichomoniasis. Syphilis affects one million pregnant women per year worldwide, leading to more than 300,000 fetal and neonatal deaths and putting more than 200,000 children at risk of premature death. In Brazil, between 2012 and 2017, there was a constant increase in the number of cases of syphilis in pregnant women, both congenital and acquired[2]. More specifically, from 2014 to 2015 there was an increase of 32% in cases of syphilis in adults — being more than 20% in pregnant women[3].

Syphilis in pregnant women includes cases that, during the prenatal period, present clinical and/or serological evidence that is not reactive, with positive or non-performed treponemal test; and congenital syphilis is the result of hematogenous dissemination of *Treponema pallidum*, from infected pregnant women who are not treated or inadequately treated to her conceptus, via placenta[1]. If a pregnant woman is infected, at any stage of the disease, the child can be born with congenital syphilis. The relevance of this topic concerns

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the serious consequences that the disease can cause to the child, including neurological and bone malformations, and even death[3].

In view of the syphilis epidemic affecting Brazil, whose detection rate increased from two cases per 100,000 inhabitants in 2010 to 58.1 cases per 100,000 inhabitants in 2017[4], the Federal Court of Accounts (TCU) and the Ministry of Health jointly launched in 2017 the national strategy "Rapid Response to Syphilis in Care Networks". The project promotes cooperation actions to strengthen the process of planning actions to fight syphilis in locoregional spaces. Recommended actions are management and governance, which allow the inclusion of initiatives in municipal management plans; comprehensive care, which guarantees prevention and treatment from primary care to specialized levels; surveillance, whose objective is to condition previous actions, avoiding retrocession; and "educommunication", which reinforces the dissemination of the disease to increase the population's knowledge on the subject[5].

Educommunication is an interrelationship between communication and education, in which the communicative elements influence and are fundamental to educational processes[6]. The development of different training actions reaching a large number of people using technology and innovative communication strategies is fundamental.

This research aimed to better understand the knowledge about syphilis and control measures of pregnant women assisted at the Maternity Divino Amor, located in the municipality of Parnamirim in the state of Rio Grande do Norte (RN), which is considered one of the main municipalities for the strategy to fight syphilis in the country. The data obtained from this study supported the development of an educational resource prototype in the form of a web application, based on technological mediation and on the interface between education and communication, for the training of pregnant women during prenatal care on related pregnancy topics, and on the coping with syphilis during pregnancy.

## OBJECTIVE

To build a prototype of an innovative educational resource mediated using technology for the training of pregnant women assisted in prenatal care about pregnancy and how to combat syphilis during pregnancy as a strategy to cope with this disease.

## METHODS

An exploratory research with a quantitative approach was developed to check for the level of knowledge about syphilis by pregnant women attending high-risk prenatal care at the maternity Divino Amor, in Parnamirim/RN, and their training needs in this area. A structured questionnaire was used to collect data, including: socioeconomic information on the interviewees; their conception about the use of information technology to access health issues; and their level of knowledge about syphilis as to infection, its characteristics, transmission, prevention and control, all measured by multiple-choice questions.

The inclusion criteria adopted for participation in the research and the constitution of the sample were: being over 18 years of age, being in the waiting room for prenatal care and accepting to participate in the study by signing the Informed Consent Form during the period selected for data collection. The researcher assisted illiterate participants in completing the research instrument by reading each question and checking the option indicated by the participant.

Data was collected by means of a questionnaire applied in loco. It started in February 2020, however it had to be interrupted due to the spread and worsening of the SARS-CoV-2 pandemic in Brazil during this period and the necessary care measures. Thus, the research stopped being a census and adopted a convenience sample, based on inclusion criteria selected during the period scheduled for data collection.

For the analysis of the data with exploratory method and quantitative analysis, the data were processed in the Microsoft Office Excel for the disposition of data and, later on, analyzed in the light of the relevant literature about the subject under study. Based on this analysis, a prototype of an open educational resource was planned and elaborated using technological mediation in the form of an App for the training of pregnant women on topics related to pregnancy and the fight against syphilis during pregnancy. The prototype was developed in the context of the Master's course in E-Learning Pedagogy, through an international cooperation between the Universidade Federal do Rio Grande do Norte (UFRN) and the Universidade Aberta de Portugal (UAB-Pt), in partnership with the Laboratory of Technological Innovation in Health (LAIS) at UFRN. LAIS is a laboratory installed at the Onofre Lopes University Hospital (Huol), located in Natal/RN, which aims to promote technological innovation in health to improve the quality of services for the whole population. Actions developed in the laboratory contemplate three lines of action: management, assistance and education. The laboratory develops information and communication technology in the most diverse facets of the health area, with focus on improving and improving the quality of health services, while also prioritizing academic training[7]. The choice for this laboratory was due to its expertise in the area of human education in health using technological mediation.

This research is part of the Distance Education and E-Learning Laboratory (LE@D) of Universidade Aberta de Portugal, a research and development unit financed by the Foundation for Science and Technology and where the Master's in E-Learning Pedagogy is based in.

The project was submitted to the Research Ethics Committees of UAB/Pt and Onofre Lopes Hospital (CEP/HUOL), and received approval for data collection (approval number of CEP/HUOL opinion: 3,825,191). In addition, a request for data collection was sent to the management of the institution where the research was intended to be carried out, to obtain authorization. All study subjects were informed about the objective and purpose of the investigation and were clarified regarding the Informed Consent Form to be signed, as recommended in resolution No. 466/2012 of the National Health Council (CNS), on ethical guidelines and regulatory standards for research on human beings[8].

## RESULTS

A total of 46 pregnant women were assessed according to the inclusion criteria and their availability. It was possible to characterize

the research subjects and verify their level of knowledge about syphilis, which supported the development of the web application prototype called "Conversa de Mãe" ("A mother's talk"), as explained moving forward, with the presentation and description of the app's screens.

## Characterization of research subjects

### *Socioeconomic profile of pregnant women*

The age of the interviewees ranged from 18 to 40 years old or more, with the most prevalent range being 21 to 30 years old (50%), followed by 31 to 40 years old (37%). Regarding the educational level of the interviewees, most of them (29, 63%) studied up to high school, as shown in **Figure 1**.

With regard to family income, 14 pregnant women (30%) reported a family income less than one minimum wage and 21 (45%) declared a family income of one minimum wage, as shown in **Figure 2**.

The most prevalent marital status in this study was having a partner: 20 pregnant women interviewed declared they were married (43%) and 14 said they had a stable relationship (30%), as shown in **Figure 3**.

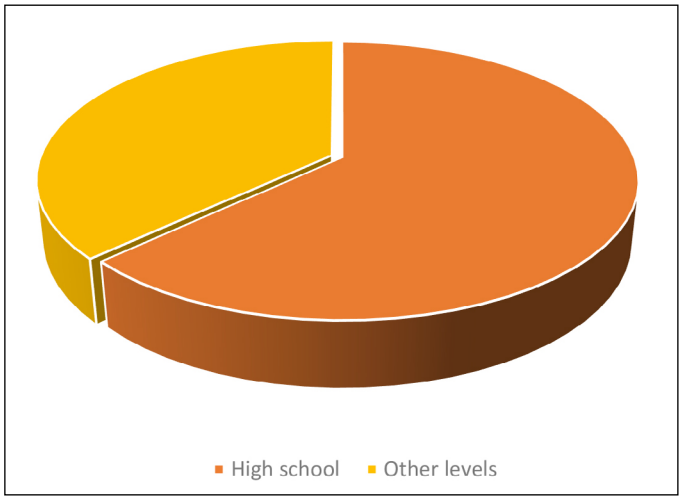



**Figure 1 –** Educational level.

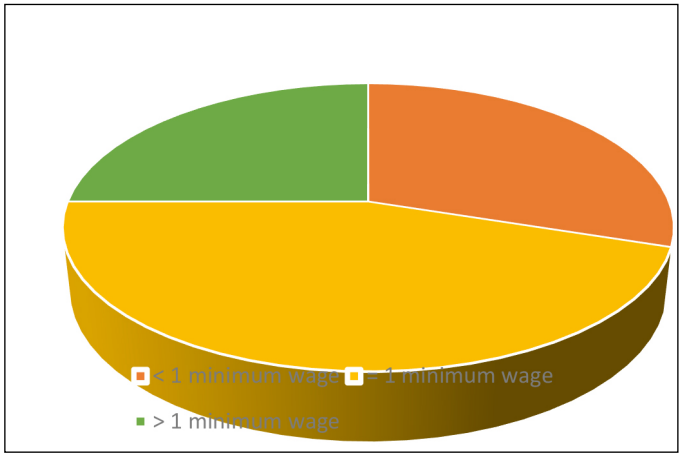



**Figure 2 –** Family income.

### *Use of information technology by pregnant women*

Regarding the use of information technology by pregnant women, the 46 participants claimed to have a cell phone. Of them, 44 (96%) used the internet via cell phone and two (4%) reported not using it. The type of connection they most adopted for remote internet access was wi-fi network (28, 61%). Forty-two (91%) reported using apps on their cell phones, mostly the message exchange app WhatsApp (35, or 76%), to the detriment of other social media apps such as Instagram and Facebook, and news or health apps (**Figure 4**).

When asked about their interest in using an educational app about syphilis in pregnancy, 26 (56%) said they were interested and 20 (44%) said they were not interested (**Figure 5**).

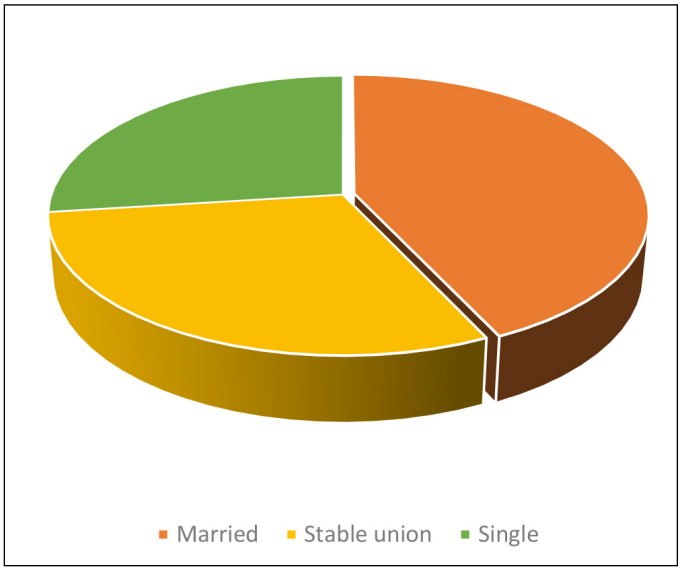



**Figure 3 –** Marital status.

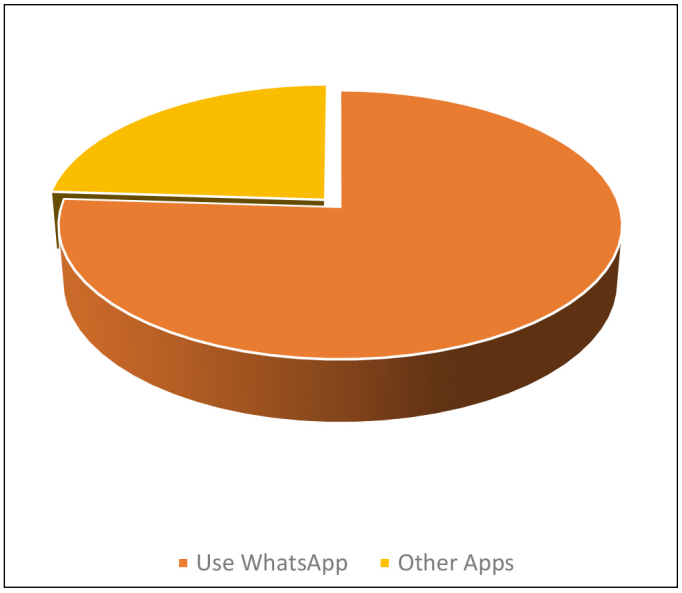



**Figure 4 –** Use of WhatsApp app on mobile phones.

Given the absence of predominantly affirmative answers, we decided to develop an educational application that addressed more general issues related to pregnancy, such as: body modifications, tips and recommendations for nutrition, breastfeeding, prenatal care, exams to be performed etc. Thus, within these themes, topics about syphilis in pregnancy would also be addressed, aiming to further clarify pregnant woman about its diagnosis, prevention and proper treatment.

## *Knowledge of pregnant women about syphilis*

When asked what syphilis is, most pregnant women (43, or 93%) demonstrated knowing it is an STI. However, it is noteworthy that although this vast majority point to the disease as an STI, their real understanding of it may be vague and incomplete.

Gaps in understanding the signs and symptoms of the disease were seen. Although most participants had secondary education and pointed out that syphilis is an STI, 18 (39%) pregnant women selected incorrect alternatives regarding the signs and symptoms of the infection, and 10 (22%) of them declared not knowing the answer (**Figure 6**).

Regarding the form of transmission of syphilis, 35 (76%) pregnant women indicated unprotected sexual intercourse (without a condom) with an infected person or the passage from mother to child during pregnancy or childbirth. Regarding the diagnostic methods for syphilis, when asked how one could find out if they had the infection, 37 (80%) answered correctly that the diagnosis is made by means of a rapid test and laboratory blood tests for confirmation of diagnosis (laboratory study of venereal diseases — VDRL), as shown in **Figure 7**.

An infected pregnant woman, when diagnosed, must be promptly treated, as well as her sexual partners[5]. In this research, most pregnant women (43, or 93%), when asked about the need for her partner or partner of a person diagnosed with syphilis to also undergo the diagnostic test answered it is essential that partners are tested for syphilis and treated to stop transmission. Therefore, they showed a knowledge that is in accordance with what is recommended by the Ministry of Health.

Differently from what many women think, syphilis can also be acquired by vertical transmission, via the placenta from the mother to the fetus, causing great impacts if the child is infected. From this perspective, about vertical transmission, 34 (74%) of the investigated pregnant women stated that a pregnant woman can transmit to the child at any stage of pregnancy (**Figure 8**). However, two of them (4%) said that there is no risk for the child and ten (22%) were unable to answer, revealing a considerable deficit of knowledge in 26% of the participants when asked about the possibility of syphilis vertical transmission.

Regarding prevention measures, or how a pregnant woman could prevent syphilis, a significant percentage of respondents (14, or 31%) declared not knowing the prevention measures against the disease (**Figure 9**). There is a gap of information about the fundamental measures to control syphilis in pregnant women and, consequently, about congenital syphilis.

Most pregnant women (40, or 87%), when answering the questionnaire, marked the correct alternative about the treatment of syphilis, which states that there is a treatment for the disease and that it

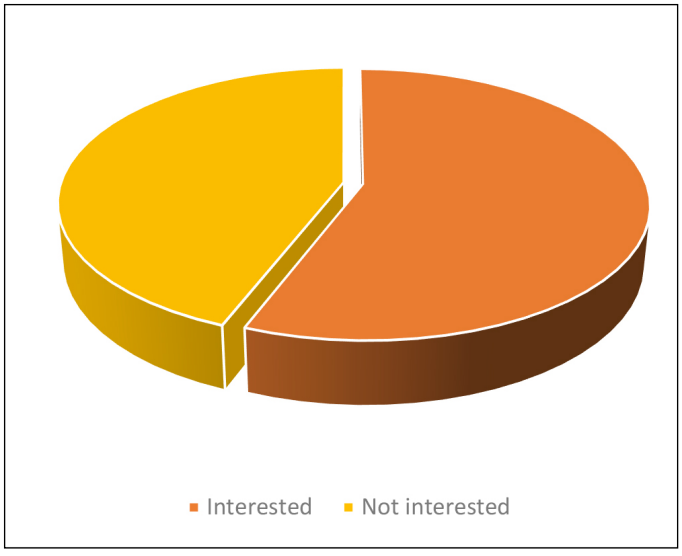



**Figure 5 –** Interest in using an educational app about syphilis.

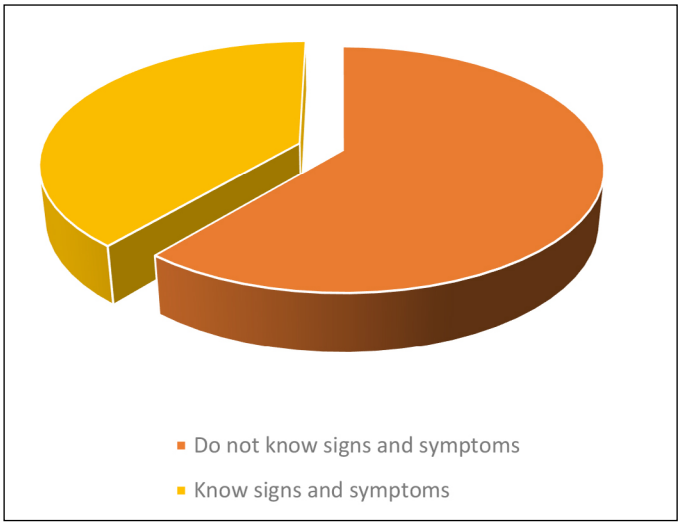



**Figure 6 –** Signs and symptoms of syphilis.

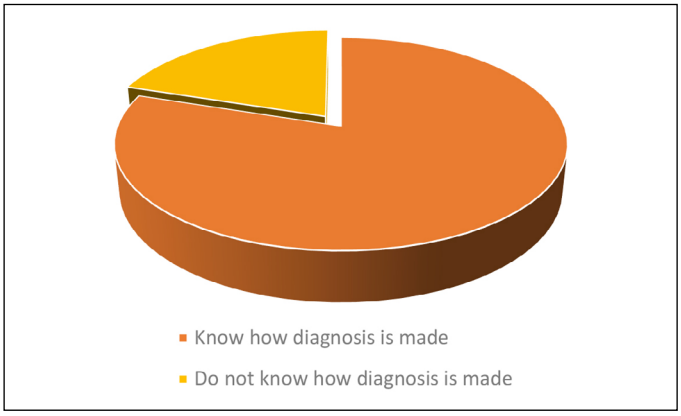



**Figure 7 –** Syphilis diagnosis.

is done with the antibiotic benzetacil; as for serological follow-up, 38 (83%) of them indicated that it was necessary to undergo periodic blood tests to confirm the cure.

In general, although the vast majority of participants had a high rate of correct answers, above 71%, there are gaps in knowledge about syphilis, especially with regard to signs and symptoms, prevention measures and vertical transmission. Therefore, it is of utmost importance that, during prenatal consultations, this and other information is provided so that possible queries are clarified regarding the harm it may bring to the pregnancy[9].

Considering the importance of using information technologies for health education and the findings of the research, the following topic presents a model of a technology-mediated educational tool, in the format of a web application designed for the training of pregnant women about pregnancy and syphilis in pregnancy.

## *The app "Conversa de Mãe"*

The app "Conversa de Mãe" is a proposal for a technology-mediated health education tool for pregnant women, which intends to assist them in the acquisition of information about the most diverse topics related to care during pregnancy, such as tips and recommendations on nutrition, physical activity, vaccination, breastfeeding, prenatal care and childbirth, coping with syphilis in pregnant women. The app clarifies the signs and symptoms of the disease and its prevention, diagnosis and treatment, addressing the issues in a dialogic and interactive way.

This tool was developed in the webapp format, that is, a website that behaves like an application and can be accessed via a URL, so it does not need to be downloaded to a computer or mobile device. This application model is cross-platform adaptable, takes up no memory space on the device, and is easy to access and share.

The functional properties of the web application proposed with the study will be described in the following topics, presenting information regarding its structure, behavior, processes and data organization. In **Figure 10**, we have the application's login screen, through which the user can type their email and password. After an initial registration, the user's login information will be recorded, allowing them to access their profile at other times by just typing email and password.

The application's home screen (**Figure 11**) is composed of a presentation of the digital tool and six main menus: "Meu perfil" (My Profile); "Vamos conversar" (Let's talk?); "Se liga" (Stay tuned); "teste seus conhecimentos" (Test your knowledge); "Sala de conversa" (Chat Room); and "Jogos" (Games). On this main screen, the pregnant woman must click on the desired option to then be directed to the next screen.

The app for pregnant women allows access to various interfaces, including My Profile (**Figure 12**), where the user can include personal data such as name, email, cell phone number, date of birth,

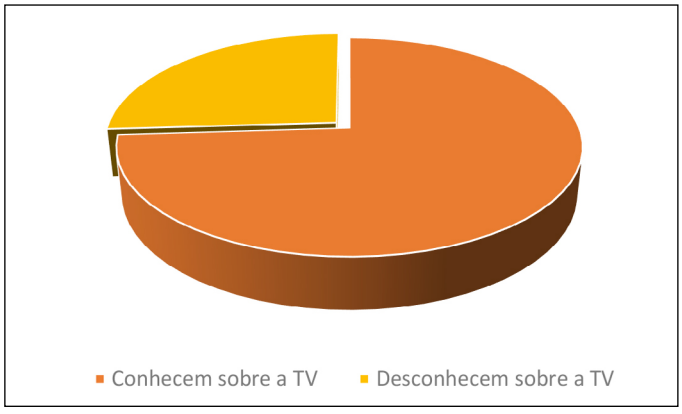



**Figure 8 –** Vertical transmission of syphilis.

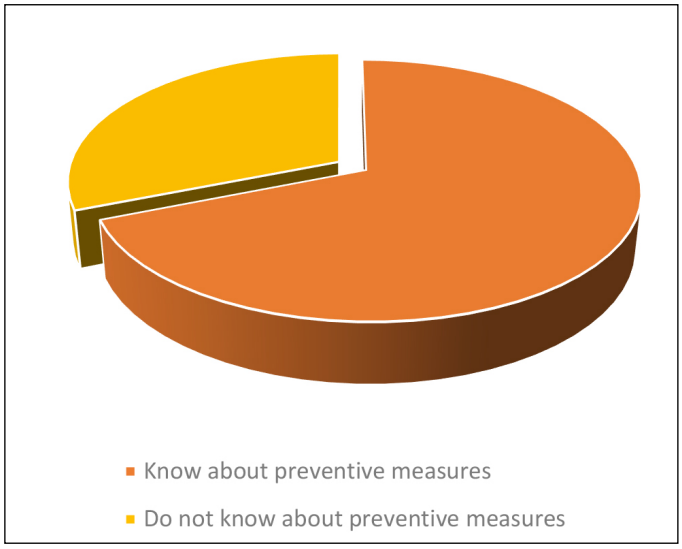



**Figure 9 –** Syphilis prevention measures.




**Figure 10 –** Login screen.

profile photo and pregnancy data (date of last menstruation, probable date of delivery, gestational age and appointment dates) in the prenatal agenda field.

The "Let's Talk?" menu (**Figure 13**) gives access to six educational videos on topics related to pregnancy and measures to cope with syphilis in pregnancy and congenital syphilis, so that the user will have access to the following information in each available video: Pregnancy-related changes (video 1), with guidance on emotional and physical changes of pregnancy and the importance of starting prenatal care; STIs and Syphilis in Pregnancy (video 2), which addresses the concept and classification of STIs, prevention measures, and signs and symptoms of syphilis in pregnancy; Well-Being (video 3), which deals with adequate nutrition during pregnancy, the importance of physical activity during pregnancy and vaccination during prenatal care; Exams (video 4), which discusses some exams to be performed in the prenatal period, the importance of rapid screening tests for HIV and syphilis, and what is congenital syphilis; Partner Participation (video 5), which deals with the importance of the partner's presence in prenatal care, syphilis treatment and the importance of medical follow-up during treatment; and finally the video on Breastfeeding, Labor and Childbirth (video 6).

The app also has the "stay tuned" function, an interaction interface between the application system and the user, in which they will receive notifications according to the information filled in in the profile customization so that they are always up to date with the quick test for syphilis at the beginning of the first and third trimesters and on admission to the hospital for delivery.

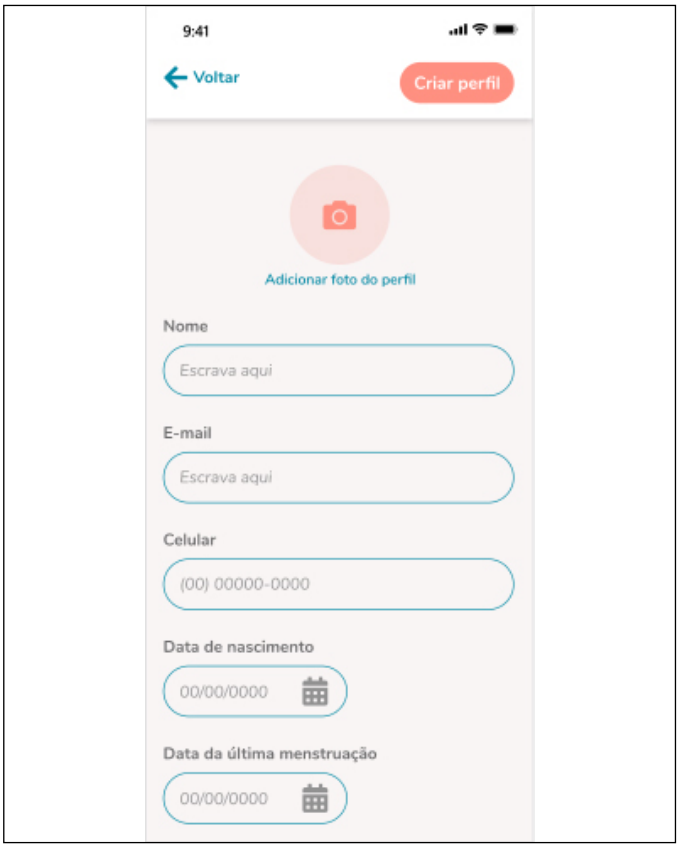



**Figure 12 –** Profile screen.

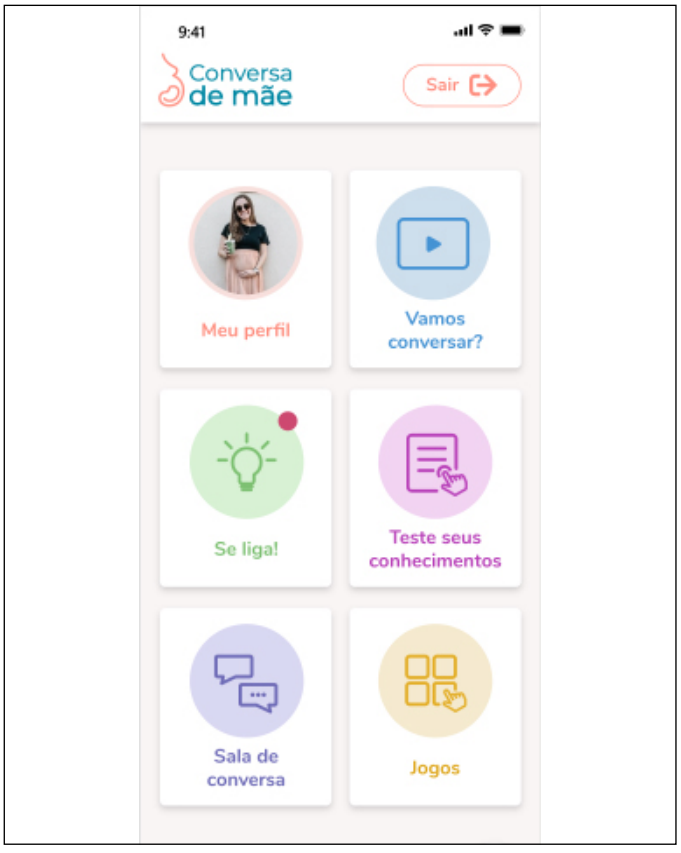



**Figure 11 –** Main menu screen.

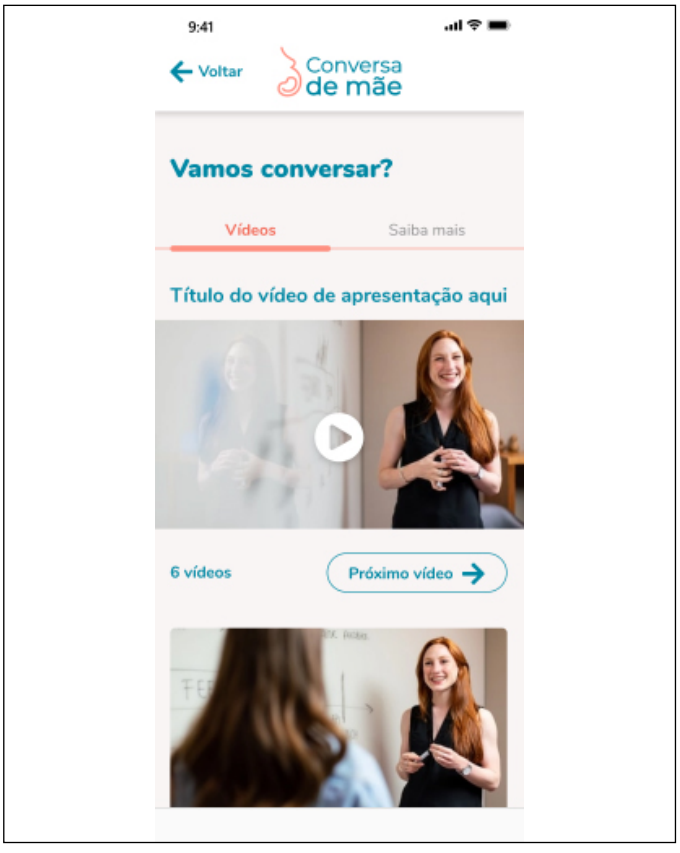



**Figure 13 –** Screen "let's talk".

The "Group Chat" (**Figure 14**) is a function that allow users to interact on various topics covered in the app and related to both pregnancy and syphilis during pregnancy, exchanging information about queries and experiences by message that can be liked and answered.

"Test Your Knowledge" (**Figure 15**) is an interface where the user will fill in a questionnaire on topics covered in the web app's educational videos to test their knowledge after having had access to the informative content. The questions are divided into sessions related to the themes of each video in the "Let's Talk?" menu.

Finally, the web application has the Games menu (**Figure 16**), where the knowledge assimilated by the user will be worked on and reinforced in educational games.

## DISCUSSION

The application prototype was developed based on an instructional design consisting of several steps, including: needs assessment and target audience characterization, bibliographic reference collection, content definition, technology-mediated resource planning in the web application format, and creation of a case diagram to guide the construction of the tool; production of educational content through videos, design of interfaces (layout) and definition of the webapp navigation structure and functioning.

The web application presents relevant information related to pregnancy, prenatal care, childbirth, breastfeeding, syphilis in pregnancy and congenital syphilis, as well as measures to prevent and control this public health problem, with exposure of the contents

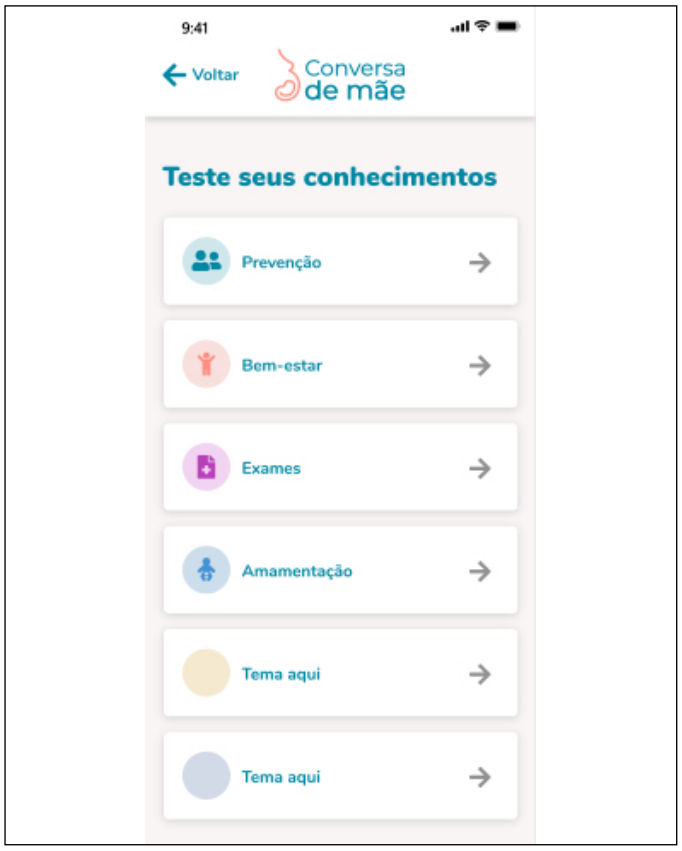



**Figure 15 –** Screen "Test your knowledge".




**Figure 14 –** Chat room screen.

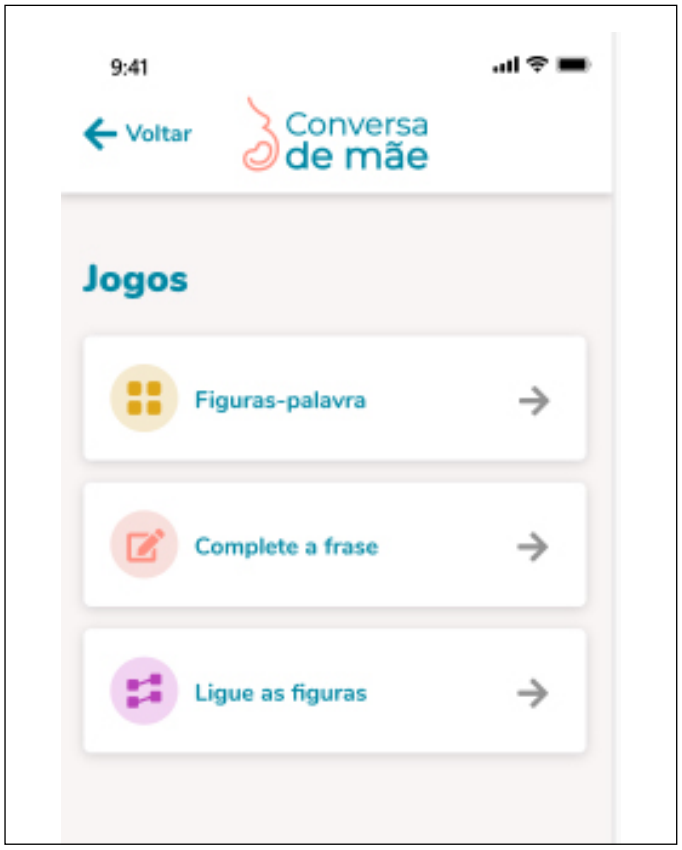



**Figure 16 –** "Games" screen.

through audiovisual means to provide more stimuli for those receiving the information, improving their capacity for assimilation and understanding.

These resources can maximize the range of stimuli for the learner to capture different information necessary for the teaching-learning process and enabling meaningful learning, as it anchors learning in different bridges that can be significant for the student and relate to their background knowledge. Furthermore, these tools can generate greater interest, motivation and dynamism[10].

The advances in mobile devices associated with the advent of applications favor the teaching-learning process. The appropriation of information, especially with regard to health and health practices, promotes changes and actions that lead to the development and strengthening of actions capable of enriching knowledge of the parties involved in the process[11].

With the development of the webapp prototype, it was possible to verify its potential for teaching-learning actions, expanding the understanding of the possible roles of health technologies in teaching-learning for different areas of knowledge. The suggested webapp is an important source of information for the adoption of preventive health measures by users, enabling the acquisition of many skills by the user in their health learning process with the available resources.

Mobile technologies favor self-learning, social relationships, sharing experiences and collaborative learning, providing access to knowledge anywhere and anytime[12].

Digital learning ecosystems are a means to help the student to develop critical thinking, initiative and entrepreneurship, autonomy, communication and collaboration skills[13]. This autonomy contributes to the empowerment of the health user, so that they can act as a protagonist in their own health consciously and sensitized with regard to the adoption of prevention measures, with a view to incorporating healthy habits.

Several applications on the theme of pregnancy, childbirth and puerperium, including maternity and paternity, are available to provide information and guidance with tips or videos on a wide range of topics, helping parents and making them more prepared and confident to face the new challenges[14].

In a study carried out to evaluate the prototype of the GestPro application, with guidance for pregnant women about physiological changes and care during pregnancy, the application was shown to play an educational role by means of information technology for health promotion, representing an incentive to self-care and the search for prenatal care, and a stimulus to the autonomy of care[15].

Another survey aimed at pregnant women assessed the use of the "Healthy Pregnancy" mobile app for smartphones as a tool for adherence to prenatal consultations and identified that the pregnant women who were most present at prenatal consultations corresponded to those who used the tool, which proves the effectiveness of the application. This directly impacted the empowerment process of pregnant women because it is a dynamic technology, capable of boosting dialogue between professionals and women[16].

Mobile applications that have an interactivity tool for exchanging information between users and with health professionals provide greater adherence to treatment, improve patient safety and creates bonds[17].

These findings reinforce the potential effects of interactivity. By the same token, the webapp has the "user notifications" feature ("Stay tuned" and "Chat Room" menus). It enables the formation of communities in which users can feel free to share queries, information and experiences, contributing to shared learning on various topics covered by the application.

Other relevant features of the webapp are: testing assimilated knowledge and gamification resources through games to reinforce, in a playful way, the acquisition of information and knowledge worked with the webapp resources, generating a relaxed opportunity to build themselves representations resulting from the learning process and, therefore, to consolidate them.

Some studies in the area of digital and electronic games articulate the relationship of these new media with learning spaces, signaling effective possibilities between playful tools that approach the semiotic universe of the learner and the learning process[18].

### Strengths

This study enabled the use of an instructional design in a distance health education tool, with various resources that new technologies and their applications make possible, to implement the educommunication strategy focused on health promotion in the context of coping with syphilis.

### Limitation

The ongoing SARS-CoV 2 pandemic made it difficult to collect data for exploratory research from the pregnant women regarding their level of knowledge about syphilis. The collection was interrupted due to precautionary measures against the spread of the pandemic; so it was no longer census-based and adopted a convenience sample, according to the inclusion criteria selected during the period scheduled for data collection.

## CONCLUSION

The prototype of web application proposed in this study as an educational resource mediated by technology aims to reach the maximum number of pregnant women in the network (web app's target audience), so that they have access to the tool and expand their knowledge related to pregnancy and syphilis during pregnancy, contributing to the improvement of indicators and the reduction of cases of syphilis among pregnant women and congenital syphilis through distance health education actions during prenatal care.

This action could contribute to the fight against syphilis during pregnancy, enabling a health education strategy that helps in the scope of educommunication, with the use of new communication and education technologies. The web application described in this work can better meet the information needs of pregnant women assisted in prenatal care and also facilitate the work of health professionals. Thus, the tool presents itself as complementary to

prenatal care in the context of health education actions, aimed at promoting the health of pregnant women and preventing diseases.

### Participation of each author

Idealization: ACBLO, APD, LM; Research: ACBLO; APD, LM; Text: ACBLO, APD, LM. Revision: ACBLO, APD, LM, AKOC, MSOJ, ABAMM. Images: ACBLO, AKOC, MSOJ, ABAMM.

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## CONFLICT OF INTERESTS

There is no conflict of interest to be reported.

## REFERENCES

1. Brasil. Ministério da Saúde. Diretrizes para controle da sífilis congênita: manual de bolso. Brasília: Ministério da Saúde; 2006.
2. Brasil. Ministério da Saúde. Agenda de Ações Estratégicas para Redução da Sífilis no Brasil [Internet]. Brasília: Ministério da Saúde; 2017 [cited on Aug 22, 2021]. Available at: http://www.aids.gov.br/pt-br/pub/2017/agenda-de-acoes-estrategicas-para-reducao-da-sifilis-no-brasil
3. Germano F. A nova cara da sífilis. Super Interessante [Internet]. 2017 [cited June 13, 2017]. Available at: https://super.abril.com.br/saude/a-nova-cara-da-sifilis/#:~:text=59%25%20das%20crian%C3%A7as%20nascidas%20de,que%20%C3%A9%20um%20n%C3%BAmero%20pequeno
4. OnuBrasil. Aumentam casos de sífilis no Brasil [Internet]. 2018 [cited on Mar 10, 2021]. Available at: https://nacoesunidas.org/aumentam-casos-de-sifilis-no-brasil-diz-ministerio-da-saude/
5. Brasil. Ministério da Saúde. Guia de vigilância em saúde. Brasília: Ministério da Saúde; 2017.
6. Sartori AS, Soares MS. Concepção dialógica e as NTICs: a educomunicação e os ecossistemas comunicativos. In: Colóquio internacional Paulo Freire, 5, 19 a 22 de Setembro 2005; Recife (PE), Brasil. Recife (PE); 2005.
7. Laboratório de Inovação Tecnológica em Saúde [Internet]. 2019 [cited on Nov 18, 2019]. Available at: https://lais.huol.ufrn.br/
8. Brasil. Resolução nº 466, de 12 de dezembro de 2012. Aprova as diretrizes e normas regulamentadoras de pesquisa em seres humanos [Internet]. Brasil; 2012 [cited on Jun 13, 2021]. Available at: https://bvsms.saude.gov.br/bvs/saudelegis/cns/2013/res0466_12_12_2012.html
9. Lima CF. Conhecimento das gestantes acerca da sífilis na gestação [final project]. Juazeiro do Norte: Faculdade de Juazeiro do Norte; 2018.
10. Silva AF, Souza AM, Lima RS, Lacerda NLS. Importância da arte e de recursos audiovisuais no processo de ensino aprendizagem. In: Portela KCA, Schumacher AJ. Produção científica e experiências exitosas na educação brasileira 3. Ponta Grossa: Atena; 2019. p. 296-306.
11. Rocha FS, Santana EB, Silva ÉS, Carvalho JSM, Carvalho FLQ. Uso de Apps para a promoção dos cuidados à saúde. In: Seminário Tecnologias Aplicadas a Educação e Saúde, maio 2017, Salvador (BA), Brasil. Anais [Internet]. Salvador; 2017 [cited on May 11, 2021]. Available at: https://www.revistas.uneb.br/index.php/staes/article/view/3832
12. Costa AAL, Mendes Neto FM, Sombra EL, Moreira JDC, Valentim RAM, Sales AFA. Recomendação personalizada de conteúdo para suporte à aprendizagem informal no contexto da saúde. Renote [Internet]. 2014 [cited on May 26, 2021];12(1):1-10. Available at: https://seer.ufrgs.br/renote/article/view/49840/31197 https://doi.org/10.22456/1679-1916.49840
13. Moreira JA. Reconfigurando ecossistemas digitais de aprendizagem com tecnologias audiovisuais. Em Rede [Internet]. 2018 [cited May 26, 2021];5(1). Available at: https://www.aunirede.org.br/revista/index.php/emrede/article/view/305
14. Oliveira GM, Santos LF. Uso de aplicativos para dispositivos móveis no processo de educação em saúde: reflexos da contemporaneidade. Rev Observatório [Internet]. 2018 [cited on Jul 6, 2021];4(6):34-42. Available at: https://sistemas.uft.edu.br/periodicos/index.php/observatorio/article/view/5357/14253 http://dx.doi.org/10.20873/uft.2447-4266.2017v4n6p826
15. Cavalcante M. Desenvolvimento de um protótipo de aplicativo na educação em saúde para gestantes [online final project]. Centro Universitário UNINOVAFAPI; 2018 [cited on Jul 6, 2021]. Available at: https://assets.uninovafapi.edu.br/arquivos/old/arquivos_academicos/repositorio_Biblioteca/enfermagem/20182/DESENVOLVIMENTO DE UM PROTÓTIPO DE APLICATIVO NA EDUCAÇÃO EM SAÚDE PARA GESTANTES.pdf
16. Souza FMLC. Aplicativo para dispositivo móvel como ferramenta de adesão de gestantes ao pré-natal [online thesis]. Universidade Federal do Rio Grande do Norte; 2019 [cited on May 3, 2021]. Available at: https://repositorio.ufrn.br/bitstream/123456789/27581/1/Aplicativodispositivomóvel_Souza_2019.pdf
17. Rodrigues TC, Teles LF. O uso de mensagens eletrônicas instantâneas como recurso didático. Rev Bras Estud Pedagog [Internet]. 2019 [cited on May 21, 2021];100(254):17-38. Available at: https://www.scielo.br/scielo.php?pid=S2176-66812019000100017&script=sci_abstract&tlng=pt https://doi.org/10.24109/2176-6681.rbep.100i254.3456
18. Alves L. Relações entre os jogos digitais e aprendizagem: delineando percurso. Educ Form Tecnologias [Internet]. 2008 [cited on May 26, 2021];1(2):1-8. Available at: http://repositoriosenaiba.fieb.org.br/bitstream/fieb/665/1/Rela%C3%A7%C3%A3o%20entre%20....pdf

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