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Knowledge of pregnancy care behaviors, complications, and urgent maternal warning signs up to one year postpartum among Georgia residents

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Abstract

Objectives Maternal mortality in the U.S. continues to increase, and the State of Georgia has one of the highest maternal mortality rates among the 50 states at 33.9 deaths per 100,000 live births, disproportionately affecting Black and rural populations. This study sought to ascertain knowledge of adults living in Georgia about proper pregnancy care behaviors and their ability to identify warning signs and symptoms (WSS) of life-threatening complications during pregnancy and up to 1-year postpartum.

Methods In 2022, using a cross-sectional study design, a questionnaire including items from validated instruments was distributed to adults residing in Georgia through social media and email. Questions were grouped into categories: total pregnancy knowledge, general pregnancy care behaviors, and pregnancy and postpartum WSS. Based on correct answer choices, scores were created for each of the four categories and compared by gender, age, education, race, and ethnicity using multiple linear regressions.

Results Participants ($n=588$) ranged from 18 to 76 years old and were primarily female (80%). The vast majority (83.3%) failed to identify important pregnancy care behaviors. More than half of all participants were unable to recognize pregnancy and postpartum WSS of complications, 52% and 56% respectively. Male, Black, and Hispanic self-identified adults exhibited lower recognition of pregnancy care behaviors and WSS of pregnancy and postpartum complications, relative to other genders, races, and ethnic groups, respectively ($p < 0.001$).

Conclusions This research identified important gaps in maternal health knowledge among adults living in the State of Georgia, highlighting specific opportunities for intervention and offering evidence-based information that can help improve health literacy for better maternal outcomes.

Keywords Maternal health, Health literacy, Perinatal health, Pregnancy care, Pregnancy complications, Postpartum complications, Pregnancy, Postpartum, Knowledge, Health knowledge

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Introduction

Deaths related to pregnancy, birth, and the postnatal period are largely preventable [1]. The global health community has taken steps to reduce maternal and infant mortality rates, but the United States remains steadfastly behind [2]. While the global maternal mortality rate dropped by 45% from 1990 to 2017, the U.S. rate increased by 57% during the same time period [3]. In 2022, the U.S. maternal mortality rate decreased to 22.3 deaths per 100,000 live births, but it remains significantly higher than that of other high-income countries. [4]. The State of Georgia has one of the highest maternal mortality rates among the 50 states at 33.9 deaths per 100,000 live births [5]. With most pregnancy-related deaths due to cardiovascular complications, cardiomyopathy, hemorrhage, infection, and cerebrovascular accidents; it is estimated that 87% of pregnancy-related deaths could have been prevented [6].

Many pregnancy-related deaths occur during the postpartum period; in 2017, 81% of reported pregnancy-related deaths occurred up to 1 year after birth [7]. In Georgia, maternal mortality rates disproportionately affect Black and rural populations [8]. For Black birthing parents in Georgia, the number of maternal deaths is 66.6 per 100,000, nearly 4 times the U. S. maternal mortality rate [9].

Maternal health challenges in Georgia are likely due to the interplay of a myriad of highly complex and intertwined factors: individual, cultural, and societal. Systemic issues within the current healthcare system include: maternity care deserts in rural areas with limited access to maternal-skilled health care providers [10], potential inadequate preparation of medical staff to address cultural competency, systemic racism, and unconscious bias among providers and institutions. Fragmented healthcare services may result in suboptimal care for vulnerable birthing parents, thus contributing to adverse health outcomes and further increasing health disparities among marginalized sociodemographic groups [11].

Individual factors that may increase maternal health disparities and undesired behaviors, such as delaying or avoiding seeking medical assistance, include socioeconomic status, education and health literacy [12], and burden of chronic diseases and obesity [9]. Cultural and societal factors, such as mistrust, prior negative experiences with the healthcare system, or inherent cultural norms [13–15] are additional considerations that may lead to differences in health outcomes.

Addressing maternal mortality in Georgia requires a comprehensive, multisystemic approach that considers all these interconnected individual, cultural, and societal factors. Although health literacy is only one of the many aspects that may shape successful maternal and infant health outcomes, to date, little has been done to

characterize the knowledge of adults about maternal health. This study sought to examine the knowledge of adults residing in Georgia about appropriate pregnancy care behaviors and to ascertain their ability to identify warning signs and symptoms of life-threatening pregnancy and postpartum complications that require immediate medical care seeking behaviors.

Methods

Methodology employed was a quantitative, cross-sectional research design. Previously established instruments were utilized to assess adults' knowledge of maternal pregnancy care behaviors and identification of pregnancy and post-partum symptoms of life-threatening complications that require immediate medical care seeking behaviors [16–19]. Non-probability sampling methodologies utilized were convenience and snowball techniques. This research was reviewed and approved by the Georgia Southern University Institutional Review Board Protocol Number H22228. All study procedures were done in accordance with the Helsinki Declaration of 1975 as revised in 1983. The informed consent was included as the first question in the survey and included a statement that certified that by proceeding with the survey, participants acknowledged agreement to the consent. Data collection occurred with questionnaires designed in Qualtrics XM, Provo, UT that were distributed electronically by all the study staff who reside in Georgia ($n=16$) via personal emails and social media outputs including Meta, and Twitter. Study staff also encouraged personal contacts to share the IRB approved posts among their social media sites, and to contact additional participants via email. Participants were prompted to complete the survey once, and eligibility criteria included age of 18 years or older, current residency within the state of Georgia, and declared proficiency in English. Data collection occurred between February and June of 2022.

Instrumentation

To assess the knowledge of pregnancy care behaviors, complications, and recognition of urgent maternal WSS during pregnancy and up to 1-year postpartum, previously established instruments were identified in the literature and adopted [16–19]. The most common pregnancy complications that account for maternal mortality disparities were also included (pre/eclampsia, cardiovascular complications, self-harming thoughts, bleeding, and wound complications) [8]. For purposes of this research, the following constructs were assessed: (1) identification of appropriate pregnancy care behaviors (nutrition, physical activity, weight management, potential sources of and exposure to harmful substances including mercury, alcohol, smoking, recreational drugs, and others) and (2) identification of WSS of pregnancy and postpartum

complications that could endanger the lives of the parent, embryo/fetus or infant (pre/eclampsia, cardiovascular complications, self-harming thoughts, bleeding, and wound complications).

After consolidating the sociodemographic variables of all surveys into a few, and addition of false answer options in the pregnancy and postpartum complications section a total of 72 questions were consolidated into a single instrument and beta tested to assess for understandability among a diverse sample of adults ($n=15$) from Georgia with varying sociodemographic and educational backgrounds [see Supplementary file 1 for the final questionnaire]. Face content validity was established by two maternal health experts. After data collection, internal consistency reliability was conducted for each of the four domains 1). Total pregnancy and postpartum knowledge, 2) General pregnancy care behaviors, 3) Identification of pregnancy complications, and 4). Identification of postpartum complications, with reported Cronbach alphas of 0.941, 0.746, 0.927, and 0.921, respectively. Cronbach alphas larger than 0.70 are considered reliable [20]. Data were exported from Qualtrics XM[®] (Provo, UT) to IBM-SPSS[®] version 25 (Armonk, NY). Data were carefully inspected for invalid entries, plausibility, duplicity, and errors. Responses were dichotomized for each answer as follows: correct="1" or incorrect="0", and aggregated knowledge scores were generated for each of the following four domains: (a) total pregnancy and postpartum knowledge [knowledge within the followship 3 domains with additional common pregnancy diseases], (b) general pregnancy care behaviors, [knowledge of proper nutrition and exercise behaviors, and identification of exposures that could be harmful for the pregnancy dyad, range 0–27]; (c) identification of WSS of common or life-threatening pregnancy complications including gestational diabetes, hypertensive disorders of pregnancy [preeclampsia/eclampsia], gestational diabetes, infections, other cardiovascular complications [signs and symptoms associated with deep vein thrombosis, pulmonary embolism, and cardiomyopathy], range (0–20); and (d) identification of WSS of common or life-threatening *postpartum* complications [up to 1-year] including pre-eclampsia or eclampsia, other cardiovascular complications [signs and symptoms associated with deep vein thrombosis, pulmonary embolism, and cardiomyopathy], and bleeding and infection-associated symptoms, range 0–17. Details on the variables in this study are detailed in the supplementary material and tables [see Supplementary file 2]. Scores and sub scores were transformed into a 0–100 scale for ease of interpretation, where greater scores indicate greater knowledge in each domain.

Statistical analysis

Data were inspected, and implausible or repeated responses were addressed. Multivariable linear regression models were constructed to examine participants' knowledge in each domain: (a) total pregnancy and postpartum knowledge; (b) pregnancy care behaviors; (c) identification of WSS during pregnancy, and (d) identification of WSS up to 1 year postpartum. All models included the following factors: participant's age in years, participant self-reported race, ethnicity and gender, and personal history of pregnancy or parenting experience. Individual model assumptions of normality and equal variance of residuals were evaluated for each outcome and considered normal when presented with skewness $<|2|$ [21].

To compare the proportion of participants who identified WSS during pregnancy and postpartum across sociodemographic groups, Chi-square tests were calculated.

Results

Sociodemographic characteristics of study participants

A total of 588 adults residing in the State of Georgia participated in this study. Participants could select to respond or not respond to any question. The mean age of respondents was 28.5 ± 10.4 years (range 18 to 76), 67.2% were ≤ 30 years old, 80.3% self-identified as women, 68.2% White, and 49.0% had previously either been pregnant or parented a child. Table 1 details the sociodemographic characteristics of study participants and summarizes the standardized scores of the knowledge domains assessed in the study.

Maternal health knowledge

Overall, mean knowledge scores among all participants for each scale included: total pregnancy and postpartum knowledge (49.9 ± 18.5), pregnancy care behaviors (55.1 ± 16.3), pregnancy WSS (40.6 ± 24.6), and postpartum WSS (38.4 ± 25.5).

After adjustment, Black and Hispanics were significantly more likely to exhibit lower scores across all domains: total pregnancy knowledge, pregnancy care behaviors, and both pregnancy and postpartum urgent WWS ($p < 0.05$) compared to female, white, non-Hispanic participants, and those self-identified as men ($p < 0.001$). Respondents with prior history of pregnancy or parenting experience were significantly more likely to have greater general knowledge ($p = 0.001$), knowledge of pregnancy care behaviors ($p < 0.001$), and of postpartum WSS ($p < 0.004$) compared to those without prior pregnancy or parenting experience. No differences were observed for WSS during pregnancy for this sociodemographic group, $p = 0.150$. Detailed model results are included in Table 2.

Almost three quarters of survey respondents (72.20%) incorrectly perceived that birth control was more

Table 1 Sociodemographic characteristics of study participants, and means (standard deviations) of the following domains: pregnancy and postpartum knowledge, pregnancy care behaviors, WSS of pregnancy complications, and WSS of postpartum complication [1]

Characteristics	Descriptive statistics n (%)	Total Pregnancy & Postpartum Knowledge ²	Pregnancy Care Behaviors ²	Pregnancy WSS of Complications ²	Postpartum WSS of Complications ²
Age					
18.0 to 20.9 years	76 (12.9%)	39.5 (20.4)	45.8 (16.1)	33.4 (27.5)	28.5 (27.5)
21.0 to 29.9 years	317 (53.9)	51 (18.6)	54.9 (16.7)	42.3 (24.6)	39.4 (26.1)
30 years or more	192 (32.7)	51.5 (16.7)	58.9 (14.3)	40.7 (23.2)	40.4 (22.9)
Self-identified gender					
Women	465 (80.3)	52.6 (17.2)	57.8 (14.8)	44.0 (23.6)	41.9 (24.8)
Men	107 (18.5)	37.2 (19.6)	43.5 (17)	27.2 (23.9)	25.0 (23.9)
Non-binary, other	16 (2.7)	41.7 (20.4)	42.9 (20.8)	42.9 (27.5)	34.5 (27.0)
Education attainment					
Highschool	85 (14.5)	48.1 (19.9)	51.4 (18.5)	41.9 (25.0)	37.6 (26.9)
Partial or complete Bachelor's	372 (63.4)	49.1 (18.7)	53.8 (16)	39.8 (25.2)	37.6 (25.8)
Masters or above	130 (22.1)	53.1 (16.9)	60.8 (14.2)	42.4 (23.0)	41.5 (23.8)
Self-identified race					
Black	141 (24.0)	38.1 (19.1)	45.0 (18.7)	28.9 (23.0)	25.9 (22.6)
White	401 (68.2)	54 (16.5)	58.8 (13.7)	46.1 (23.2)	44.0 (24.5)
Other, multiple, or undeclared	12 (2.0)	42.4 (20.3)	47.8 (17.4)	29.3 (26.1)	27.0 (26.4)
Self-identified ethnicity					
Hispanic	118 (20.5)	41.8 (10.9)	55.0 (9.0)	25.9 (16.8)	26.0 (16.5)
History of previous pregnancy or parenting experience					
Yes	281 (49.0)	53.1 (16.0)	60.0 (12.9)	42.8 (22.9)	42.0 (23.5)

¹ Except for the column titled "descriptive statistics, which are n (%), all other values are means (standard deviations).

² Values were transformed in a 0-100 scale for ease of interpretation, where greater scores indicate more knowledge.

Table 2 Characteristics of respondents associated with knowledge scores of total pregnancy and postpartum knowledge, pregnancy care behaviors, pregnancy WSS, and postpartum WSS in multivariable linear regression

Characteristics	Total Pregnancy and Postpartum Knowledge ^a n = 435		Pregnancy Care Behaviors ^b n = 473		Pregnancy WSS ^c n = 564		Postpartum WSS ^d n = 568	
	Standardized coefficients (Beta)	P value	Standardized coefficients (Beta)	P value	Standardized coefficients (Beta)	P value	Standardized coefficients (Beta)	P value
Age (years)	-0.03	0.598	-0.03	0.493	0.03	0.489	-0.03	0.568
Gender (reference variable: "women")								
Male	-0.22	< 0.001	-0.19	< 0.001	-0.23	< 0.001	-0.20	< 0.001
Nonbinary or other	-0.06	0.145	-0.09	0.029	0.00	0.983	-0.03	0.448
Education (reference variable: "Master's or above")								
High School	-0.02	0.663	-0.08	0.130	0.04	0.398	-0.01	0.823
Partial or complete Bachelor's	-0.06	0.217	-0.10	0.045	-0.01	0.761	-0.04	0.427
Race (reference variable: "White")								
Black	-0.30	< 0.001	-0.28	< 0.001	-0.24	< 0.001	-0.25	< 0.001
Other or undeclared	-0.11	0.015	-0.12	0.006	-0.08	0.055	-0.08	0.042
Hispanic ¹	-0.34	< 0.001	-0.15	0.001	-0.40	< 0.001	-0.36	< 0.001
Previous ¹ pregnancy	0.17	0.001	0.24	< 0.001	0.07	0.150	0.14	0.004

^a R²=0.28; Standard Error: 15.6

^b R²=0.25; Standard Error: 13.8

^c R²=0.27; Standard Error: 20.8

^d R²=0.24; Standard Error: 22.3

¹ Reference for Hispanic: Non-Hispanic, and for Previous Pregnancy is "no pregnancy or parenting experience".

hazardous to a person’s health than pregnancy. A small percentage (39.50%) correctly responded that the embryo was at greatest risk from exposure to drugs and alcohol during the first trimester of pregnancy. Only 16.70% had knowledge of the maximum amount of recommended daily caffeine during pregnancy. Additionally, 21.10% of participants could identify 4 or more exposures that could be harmful to the pregnant person, developing embryo/fetus during pregnancy (Data not presented in table). Table 3 provides the proportion of participants by sociodemographic group that correctly identified negative behaviors or complications during pregnancy, and Table 4 during the postpartum period.

Less than a quarter of participants (23.70%) were aware of the healthy weight gain ranges during pregnancy and only about half (48.30%) indicated that if a person is overweight or obese, losing weight prior to pregnancy may have a positive impact on the pregnancy. Most participants (65.50%) did not recognize to avoid contact sports such as basketball during pregnancy Data not presented in table.

Signs and symptoms of pregnancy complications

About half of the participants identified warning signs of complications that may occur during pregnancy, including vision changes (47.5%), severe nausea and vomiting

(47.7%), vaginal discharge (55.1%), and abdominal pain (57.1%). Almost half of participants (43.4%) failed to recognize self-harming thoughts as an important warning sign which could endanger the life of the pregnant parent or embryo/fetus during pregnancy. A little over a third of the participants (37.2%) recognized signs of cardiovascular complications that require immediate medical health seeking behaviors, and only half of participants properly identified 4 signs of preeclampsia or eclampsia (50.4%) Data not presented in table.

Signs and symptoms of postpartum complications

Almost half of participants (43.8%) recognized vision changes as a warning sign of complications while 51.9% failed to identify tachycardia as an alarm sign. Other warning signs that respondents recognized included severe nausea and throwing up (45.6%), a persistent headache that cannot resolve and worsens with time, and chest pain (52.3%). Overall, only 31.7% could identify 4 or more signs of cardiovascular complications during the postpartum period. Additionally, one third (34.30%) of individuals knew at least 4 signs of wound complications, and only 40.1% knew 4 signs of pre-eclampsia Data not presented in table.

Table 3 Proportion of participants by sociodemographic variables with correct identification of signs and symptoms of potentially harmful exposures or common complications during pregnancy [1]

Demographics	Harmful exposures	P-value	CV Complications ²	P-value	Pre/eclampsia	P-value	Self-harming thoughts	P-value
Age, years		0.13		0.21		0.17		0.02
18 to <21	12.3%		34.3%		40.3%		40.3%	
21 to <30	21.4%		40.5%		52.9%		59.2%	
≥30	24.4%		33.0%		50.0%		57.4%	
Gender		0.02		< 0.001		< 0.001		< 0.001
Male	10.8%		21.0%		27.0%		37.0%	
Female	23.5%		41.1%		56.0%		61.1%	
Nonbinary or other	18.2%		28.6%		35.7%		50.0%	
Education		0.13		0.32		0.73		0.37
High School	14.7%		36.1%		54.2%		53.0%	
Partial or complete Bachelor’s	20.6%		35.5%		49.4%		55.4%	
≥ Masters	26.6%		43.0%		50.8%		61.7%	
Race		< 0.001		< 0.001		< 0.001		< 0.001
Black	10.4%		20.4%		29.9%		35.8%	
White	25.5%		44.4%		59.5%		64.4%	
Multiracial	9.10%		33.3%		58.3%		50.0%	
Other or undeclared	16.0%		23.3%		23.3%		53.3%	
Hispanic	6.3%	< 0.001	12.9%	< 0.001	13.8%	< 0.001	37.9%	< 0.001
Parenting experience	26.6%	< 0.001	36.9%	0.67	53.0%	0.37	60.9%	0.08

¹ X² tests, *p ≤ 0.05.

² “CV”: Cardiovascular.

Table 4 Proportion of participants by sociodemographic variables that correctly identified signs and symptoms of common postpartum complications

Demographics	CV ¹ Complications	P-value	Pre/eclampsia	P-value	Self-harming thoughts	P-value	Bleeding Complications ²	P-value
Age, years		0.18		0.06		< 0.001		0.19
18 to < 21	22.1%		27.9%		47.1%		27.9%	
21 to < 30	33.7%		43.4%		67.6%		37.5%	
≥ 30	31.9%		39.4%		58.5%		31.4%	
Gender		< 0.001		< 0.001		< 0.001		< 0.001
Male	13.7%		18.6%		43.1%		18.6%	
Female	36.2%		45.7%		67.1%		38.2%	
Nonbinary or other	15.4%		15.4%		46.2%		23.1%	
Education		0.20		0.78		0.57		0.94
High School	27.7%		41.0%		67.5%		33.7%	
Undergrad/Bachelors	30.4%		39.2%		61.4%		34.1%	
≥ Masters	38.0%		42.6%		61.2%		35.7%	
Race		< 0.001		< 0.001		< 0.001		< 0.001
Black	15.3%		18.2%		48.9%		16.8%	
White	38.2%		49.5%		68.5%		41.3%	
Multiracial	25.0%		33.3%		66.7%		25.0%	
Other or undeclared	24.1%		20.7%		41.4%		27.6%	
Ethnicity		< 0.001		< 0.001		< 0.001		< 0.001
Hispanic	10.3%		10.3%		39.3%		12.8%	
Non-Hispanic	37.8%		48.6%		69.1%		40.5%	
Pregnancy or parent-ing experience		0.08		0.43		0.50		0.58
Yes	35.7%		42.5%		64.3%		36.1%	
No	28.8%		39.2%		61.5%		33.8%	

Discussion

This research identified opportunities to improve overall perinatal health literacy among adults residing in Georgia. In this sample, those who self-identified as male, Black, other or unspecified race, Hispanics, and not having prior experience parenting a child exhibited significantly lower knowledge scores across all domains: total pregnancy care behaviors, and identification of complications, pregnancy care behaviors, and identification of signs and symptoms associated with complications during pregnancy and the postpartum period.

Maternal mortality is a serious and complex health concern in the State of Georgia and in the US that needs a comprehensive, multisystemic and socio-ecological approach. Health literacy is a distinct social determinant of perinatal health [22], with low levels associated with many adverse health behaviors and outcomes [23]. To our knowledge, this is the first study to examine maternal health literacy in Georgia in a diverse population.

Our study highlighted important disparities in maternal health literacy, and multiple opportunities to improve overall perinatal health literacy among adults residing in Georgia. In this sample, those who self-identified as

male, black, other/multiple or unspecified race, and of Hispanic ethnicity exhibited significantly less knowledge scores across all four domains. These subgroups had consistently lower scores in identifying appropriate pregnancy care behaviors and identification of pregnancy and postpartum WSS associated with complications that would require immediate medical care seeking behaviors from the pregnant or postpartum parent, relative to women, white, and non-Hispanic participants. Our findings are comparable to a nation-wide study, which found that 1 in 5 pregnant individuals had inadequate maternal health literacy and were more likely to identify as Black or Hispanic [23]. Another study reported similar findings with misconceptions of pregnancy weight gain, which were particularly pronounced in self-identified Black populations [24]. Additionally, only a small proportion of individuals in our study were able to recognize that pregnancy is more hazardous to a person's health than birth control pills. This finding aligns with two other studies which both showed an under-appreciation of health hazards during pregnancy that may be affecting reproductive choices, including contraceptive use [16, 25].

An alarming proportion of participants who responded to the survey were unable to identify many urgent, life-threatening warning signs and symptoms that during pregnancy and postpartum, would require immediate healthcare-seeking behavior. Our results were similar to other studies demonstrating poor knowledge of WSS during pregnancy and postpartum [16, 26, 27]. Knowledge was particularly limited regarding signs and symptoms of preeclampsia, cardiovascular complications, bleeding/wound complications, and mental health complications. Importantly, all pregnancy-related deaths attributed to hemorrhage, mental health conditions, cardiomyopathy, cardiovascular and coronary conditions, and preeclampsia and eclampsia were determined by the Georgia Maternal Mortality Review Committee to be preventable [28]. This report emphasizes the importance of recognizing warning signs during pregnancy, childbirth, and the postpartum period to rule out serious complications and quickly initiate treatment.

Among survey participants, black and Hispanic individuals had significantly less knowledge of WSS of complications during and after pregnancy. These findings are consistent with a study in Indiana, which documented that Black mothers were associated with having a limited knowledge of maternal postpartum urgent warning signs [29]. Unfortunately, Black populations are disproportionately burdened by poor pregnancy and postpartum outcomes (Harris, 2023) and are also more likely to be readmitted to the hospital during the postpartum period and suffer life-threatening complications [30]. Lack of knowledge of maternal complications may be an important driver for these disparities within the state of Georgia and other Southern states.

Compared to women, men exhibited significantly less knowledge of both general pregnancy care behaviors and WSS of complications during pregnancy and postpartum. While most maternal health knowledge surveys are limited to mothers, the role of partners during pregnancy and postpartum care is key in the prevention of adverse perinatal complications and the support of a successful pregnancy [31, 32]. Partners offer vital psychological and social support before-, during-, and after pregnancy, and can help recognize, encourage, facilitate and support pregnant parents to pursue immediate perinatal care [33]. The present study findings highlights a great opportunity to identify strategies to include males and partners in maternal and perinatal health. Finally, we observed an important disparity in knowledge between those without parenting or prior pregnancy experience, highlighting the need to devise strategies to reach to those who are not pregnant. This is especially important for birth-defect prevention and pregnancy planning to increase reproductive health outcomes. Reaching such populations may

require different education strategies relative to those who are already seeking obstetric care.

Strengths and limitations

Study strengths include the incorporation of a vast array of maternal health topics in the survey- from general pregnancy care behaviors to the identification of warning signs of complications during pregnancy and the postpartum period. Importantly, this is an area within maternal health research that is largely lacking in the United States, with very few studies directly addressing knowledge of warning signs of complications, timely identification of signs and symptoms of pregnancy and postpartum complications and immediate care-seeking behaviors have a tremendous potential to reduce the maternal morbidity and mortality burden and is recommended by the Surgeon General [34]. To our understanding, this is the only study that examines disparities among diverse sociodemographic groups, including racial and ethnic differences in knowledge, across all individuals, *not just mothers*. Additionally, this is the first study within the state of Georgia addressing maternal health literacy. Even though our study has a limited sample size, and the use of convenience sampling may affect generalizability to the entire adult population of Georgia, we recruited a diverse group of individuals, more than 30% self-identified as Black or other than white, and over 20% of Hispanic background, increasing our belief that we included a range of voices and experiences in our study. Further research will be needed to confirm our findings, to identify barriers and facilitators to access maternal health information in Georgia and the US, and to develop and evaluate meaningful interventions to address maternal health literacy from a health equity lens.

Conclusion

The current study unearthed a strikingly low general knowledge level of pregnancy care behaviors and identification of urgent WSS during pregnancy and up to 1 year postpartum in adults living in the State of Georgia. In addition, this study highlighted the importance of addressing disparities in maternal health literacy, a critical issue moving forward. Limited maternal health literacy among the study participants could be the result of several factors including but not limited to: the lack of comprehensive educational efforts within schools, deficiency of public education campaigns, limited access to care in rural populations, limited time and energy spent in education efforts by medical professionals, political and religious views, limited participation or interest in maternal health from other genders, social marginalization, systemic racism, and discrimination. Not only do these findings highlight a need to improve maternal health knowledge with a specific focus on vulnerable

sociodemographic groups, but also exemplifies an urgent exigency to including partners and men in the maternal health conversation.

This comprehensive study offers specific details on gaps in the knowledge of adults living in Georgia that could be easily incorporated into public health education efforts and inform practitioners at the State and county level to focus on such topics while attending their patients. s. Primary care settings and offices of prenatal care providers could be an essential outlet for patient education efforts, while incorporation of technological innovations in the field might be needed to successfully increase maternal health literacy levels among adults living in Georgia. Additionally, considering including curriculum on maternal and perinatal health in high schools and using faith-based organizations to increase maternal health literacy may improve pregnancy and reproductive health outcomes.

Lastly, future studies are needed to characterize differences between urban and rural participants and to identify feasible and potentially scalable platforms to increase maternal health literacy and other approaches that may improve pregnancy and reproductive health outcomes in Georgia and similar states.

Abbreviations

WSS Warning signs and symptoms

Supplementary Information

The online version contains supplementary material available at <https://doi.org/10.1186/s12889-024-19931-7>.

Supplementary Material 1
Supplementary Material 2
Supplementary Material 3
Supplementary Material 4

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Author contributions

AP and HB created and distributed the survey to participants. EF also distributed the survey. EF and AP analyzed the data. AP, EF, HB, and AA interpreted the data. EF, AA, and AP were major contributors in writing the manuscript. DN contributed to the conclusion of the article and with reference collection. All authors read, reviewed and approved the final manuscript.

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Data availability

All data generated or analyzed during this study are included in this published article and its supplementary information files.

Declarations

Ethics approval and consent to participate

All participants completed informed consent to be included in the study. The Georgia Southern University Institutional Review Board reviewed and approved this research project on 2/15/2022, Protocol No. H22228.

Consent for publication

Not applicable.

Competing interests

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