

Abstract

Purpose: To examine over-the-counter pain medication use in pregnancy.

Study Design and Methods: Secondary analysis of a weighted surveillance survey using the 2019 Iowa Pregnancy Risk Assessment Monitoring System (PRAMS) data. A sample of 759 pregnant women of childbearing age from Iowa was weighted to represent 31,728 Iowa mothers. The weighted sample represents 80% non-Hispanic White mothers, with smaller percentages of Hispanic (10%) mothers and non-Hispanic Black (7%) mothers, consistent with the population of Iowa. Approximately two-thirds of women had commercial insurance (66%), some college or greater education (62%), and were from urban areas (59%).

Analysis: Descriptive statistics were calculated. Variables include over-the-counter pain reliever usage among all respondents and by race/ethnicity and education level.

Results: Seventy-six percent of women reported taking over-the-counter pain relievers during pregnancy. Of these, 71% reported taking acetaminophen, 11% reported taking ibuprofen, 8% aspirin, and 3% naproxen. Nearly 80% of non-Hispanic White mothers reported taking an over-the-counter pain reliever during pregnancy compared to just 64% of mothers reported as Hispanic. Iowa mothers with a college education or greater were more likely to report over-the-counter pain reliever use during pregnancy (84%) than their counterparts with a high school education or less (64%).

Clinical Implications: Some medications may cause harm to the fetus if taken at specific time during pregnancy. Reinforcement of current pain medication education, including risks to fetus throughout pregnancy may be needed.

Key words: Medication; Nursing; Over the counter; Pain; Pregnancy.

OVER-THE-COUNTER PAIN MEDICATION USE DURING PREGNANCY

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Pain is prevalent during pregnancy, affecting 55% to 78% of women (Liddle & Pennick, 2015; Virgara et al., 2018). Pain during pregnancy often includes back and pelvic pain and is highest in the third trimester of pregnancy due to the normal physiologic changes of lordosis and pregnancy weight gain (Mota et al., 2015). Women may also experience chronic pain during pregnancy due conditions such as migraines and inflammatory arthritis (Black et al., 2019). Untreated pain during pregnancy is associated with difficulty completing activities of daily life (Liddle & Pennick, 2015), increased depression (Vignato et al., 2020), hypertension (Black et al., 2019), and a rise in opioid misuse (National Survey on Drug Use and Health, 2016; Patrick et al., 2020).

Given the prevalence of pain during pregnancy, it is not surprising that approximately 40% to 70% of pregnant women globally report taking over-the-counter (OTC) pain medications at least once during pregnancy such as miscellaneous analgesics such as acetaminophen and nonsteroidal anti-inflammatory drugs (NSAIDs) such as ibuprofen, aspirin, and naproxen (Black et al., 2019). The safety of using OTC medication depends on the specific medication, timing, and dose (Table 1). Despite the potential risks of untreated pain in this vulnerable population, as well as risks to the fetus from OTC medication use during pregnancy, only a handful of studies have formally assessed the use of OTC medications by pregnant women. A multinational study of pregnant women and women in the first year postpartum assessed medication use among 9,459 women living in 18 countries, including the United States and Canada (Lupattelli et al., 2014). In this sample, use of OTC pain medication ranged from 37.7% in South America to 69.9% in Australia. In North America, 62.9% of American and Canadian women reported using an OTC medication for pain at some time during pregnancy. A prospective, longitudinal cohort study conducted in eight demographically diverse clinical centers in the United States assessed medication use among 9,272 women during each

trimester and at birth (Haas et al., 2018). Almost one quarter of survey respondents reported taking an analgesic at some time during pregnancy, including acetaminophen (19.9%) and NSAIDs (6.6%). Among users of any type of medication during pregnancy, they tended to be older, White, higher education, and have commercial insurance. The demographic profile of use of OTC pain medication was not reported. One early study of 485 Hispanic women in the southwest region of the United States found 13% of women reported using acetaminophen, followed by ibuprofen (4%) and aspirin (3%; Bercaw et al., 2010). In that study, the demographic predictors of OTC medication of any type included higher level of education, being born in the United States, and early initiation of prenatal care. There is minimal evidence about the use of OTC pain medications in pregnancy and demographic predictors of use.

In 2019 the Pregnancy Risk Assessment Survey (PRAMS) in Iowa, a question was included about use of OTC pain medication during pregnancy, so we examined OTC pain medication use and demographic predictors of use in an ethnically and racially representative sample of women from a rural state.

Methods

Design

The study was a secondary analysis of PRAMS, a deidentified statewide dataset. PRAMS is a national surveillance

program from the Centers for Disease Control and Prevention and Health departments (CDC, 2022a). PRAMS allows for the collection of maternal infant data not collected in other sources (CDC, 2022a). Each funded state collects PRAMS data that include core questions asked across the nation, optional standard questions selected from the CDC approved list of questions, and site-specific questions created and evaluated separately by each state (CDC, 2022a). The Iowa Department of Public Health (2022) administers the Iowa PRAMS to approximately 1,800 women each year. The women are 2 to 9 months postpartum and contacted through mail and phone surveys written in English and Spanish. Nearly 43% of the state of Iowa is rural, which may hinder access to health care and proper pain education and management (Iowa Department of Public Health, 2011). Institutional review board approval was obtained from the University of Northern Iowa.

Variables

To assess use of OTC medication during pregnancy, the following items were included in the 2019 survey as a

Approximately two-thirds of pregnant women experience pain, especially during the third trimester of pregnancy.



supplement: Prescription Opioid Use. Respondents were asked whether (yes or no) they consumed each of the four OTC pain relievers (acetaminophen, ibuprofen, aspirin, and naproxen). They were considered to have taken OTC pain relievers during pregnancy if they indicated “yes” to acetaminophen, ibuprofen, aspirin, and naproxen. They were considered to have taken *nonrecommended* OTC pain relievers that could cause harm to the fetus if she indicated “yes” to ibuprofen, aspirin, or naproxen.

Dataset and Sample

Data are from the Iowa PRAMS (2019: Phase 8), the only year of the survey to include a question about OTC pain medication use that was embedded in the CDC Opioid Supplement. Each month, approximately 150 new mothers are sampled from the Iowa Vital Records birth file, which consists of infants whose birth certificates are registered in the 3 months before sampling. The sample is randomized without replacement and is stratified by race and ethnicity. Exclusion criteria include multiple gestation, adoption or surrogate births, infant is born to a mother who resides outside of Iowa, birth occurred less than 61 days or more than 183 days before pulling the sample, or missing birth certificate data. Surveys are mailed to selected mothers and, after three mailings without reply, interviewers then telephoned nonrespondents up to 15 times. Nonrespondents were eliminated from the analyses.

A total of 850 responses were collected via PRAMS in 2019, with a weighted response rate of 50% from January through December 2019. The opioid supplement, that included the OTC pain medication question, was implemented in May 2019 and ran through March 2020, collecting results from mothers with infants born in February 2019 through December 2019. This resulted in 759 collected responses. Race and ethnicity were collected from the birth certificate. Women identifying as “Hispanic” were categorized as such, whereas those who did not identify as “Hispanic” were categorized by reported racial group; that is, “White” as “non-Hispanic White,” “Black” as “non-Hispanic Black,” and all other reported races including “Chinese,” “Japanese,” “Filipino,” “Hawaiian,” “Other Asian,” “American Indian,” “Alaskan Native,” “Mixed Race,” or “Other Race” as “non-Hispanic Other.” Low response rates of non-Hispanic Black respondents are accounted for in the sampling design through oversampling. The 759 opioid supplement responses were weighted to represent 31,728 Iowa mother

and represents 80% non-Hispanic White, with smaller percentages of Hispanic (10%) and non-Hispanic Black (7%) mothers, consistent with the population of Iowa. All observations in the analysis data set are demographically described in Table 2. Some values have been suppressed due to small numbers.

Covariates

The following demographic variables, some of which are correlated with OTC pain reliever use during pregnancy, were collected from the PRAMS as well as the newborn’s birth certificate: race and ethnicity, age, education, poverty level, insurance status during pregnancy, language, and urbanity.

Data Analytic Approach

Descriptive statistics were computed using SAS version 9 through the surveyfreq procedure accounting for weight and strata to evaluate the prevalence of OTC pain reliever use with covariates in a sample of 759 Iowa mothers. To determine the statistical relationships between OTC pain reliever use during pregnancy and demographic covariates, chi-square statistical tests were conducted, also using SAS version 9.4 surveyfreq procedure. Lastly, SAS-callable SUDAAN was used to compute binary log binomial regressions to determine statistical difference between variables.

Results

Overall, 76% ($n = 535$) of mothers reported taking an OTC pain reliever during their most recent pregnancy and 17% ($n = 135$) reported taking a nonrecommended OTC pain reliever during their most recent pregnancy. For each OTC pain reliever, 72% ($n = 499$) of mothers reported taking acetaminophen, 11% ($n = 105$) reported taking ibuprofen, 8% ($n = 50$) reported taking aspirin, and 3% ($n = 21$) reported taking naproxen during pregnancy (Table 3).

Among Iowa mothers, rates of OTC pain reliever use varied by language, education, race and ethnicity, and poverty. Mothers completing the English version of the PRAMS survey reported using OTC pain relievers during pregnancy at a higher rate than their counterparts completing the Spanish version (77% [$n = 438$] vs. 59% [$n = 97$], respectively). As per Table 2, mothers identifying as non-Hispanic White reported OTC pain reliever use during pregnancy at a higher rate than mothers identifying as Hispanic (80% [$n = 183$] vs. 64% [$n = 172$], respectively). Mothers with some college education

TABLE 1. OTC PAIN RELIEVERS, FDA RECOMMENDATIONS (2020), AND POTENTIAL EFFECTS

Oral OTC Pain Relievers	FDA Recommendations	Potential Effects
Analgesic Acetaminophen	Recommended but not to exceed 4 g/day	• Maternal liver and kidney damage • Attention deficit/hyperactivity disorder in infants
NSAIDs Ibuprofen Aspirin Naproxen	Not recommended after 20 weeks of pregnancy	• Premature closure of the patent ductus arteriosus fetal shunt • Maternal hemorrhage • Fetal intracranial hemorrhage • Fetal lung and renal dysfunction • Other birth defects

TABLE 2. PARTICIPANT DEMOGRAPHIC INFORMATION

	Total Sample (N = 759)			Used Over-the-Counter Pain Reliever During Pregnancy (n = 535)			
	N	Weighted %	95% CI	N	Weighted %	95% CI	Chi-Square P-value
Language							
English	593	93.96	93.12–94.81	438	77.13	71.93–82.34	0.0003*
Spanish	166	6.04	5.19–6.88	97	58.85	50.40–67.30	
Urbanity							
Urban	536	59.21	53.58–64.84	377	73.86	67.43–80.30	0.3005
Rural	223	40.79	35.16–46.42	158	79.18	71.66–86.69	
Age group							
<25 years	172	18.99	14.35–23.63	104	65.37	52.38–78.36 ^c	0.0465*
25–29 years	239	39.36	33.66–45.06	171	74.68	65.89–83.47	
30+ years	348	41.66	36.29–47.02	260	82.16	76.49–87.84	
Race/Ethnicity							
Non-Hispanic Black	257	7.26	6.93–7.59	176	67.90	61.92–73.87	<0.0001*
Non-Hispanic White	224	79.83	77.58–82.08	183	79.66	73.88–85.44	
Hispanic	271	10.07	9.60–10.55	172	63.77	57.76–69.78	
Education							
High school graduate or less	382	37.62	32.03–43.21	252	64.11	54.48–73.75	0.0004*
Some college or associates degree	203	25.01	20.31–29.71	150	82.82	75.19–90.46	
College or greater	171	37.37	32.04–42.71	132	83.66	77.24–90.08	
Poverty level							
0%–184% federal poverty level	418	43.19	37.41–48.97	290	71.02	62.75–79.30	0.0285*
185%–374% federal poverty level	131	28.56	23.18–33.95	97	76.80	66.59–87.00	
375%+ federal poverty level	108	28.24	23.07–33.42	90	87.29	80.57–94.01	
Maternal insurance during pregnancy							
Public	315	30.31	25.04–35.58	219	69.90	60.09–79.72	0.0174*
Private	367	65.89	60.49–71.29	274	80.56	74.91–86.22	
None	55	3.80	1.69–5.91	31	50.56	22.10–79.03 ^c	

Note. Unreliable estimate (subgroup <50, or CI ≥ 20 points).

*Relationships are significant at the 0.05 level.

(83%, $n = 150$) or college education or greater (84%, $n = 132$) reported OTC pain reliever use at higher rates than those with high school or lesser education (64%, $n = 252$). Mothers living above 375% of the federal poverty level reported OTC pain reliever use at a higher rate (87%, $n = 90$) than mothers living below 185% of the federal poverty level (71%, $n = 290$). These relationships were significant. Use of OTC pain relievers was tested among other demographics: maternal age group and maternal insurance status during pregnancy where results were significant but were not statistically meaningful due to the small population size or confidence interval being greater than 25. Use of OTC pain relievers was tested among urbanity of maternal residence; however, these results were not significant. Nonrecommended OTC pain reliever use during pregnancy was also tested among

these demographic variables; however, no relationships were significant.

Discussion

Although pain is frequently experienced by women during pregnancy, little research has assessed use of OTC pain medication by pregnant women in the Midwest. Our results indicate that approximately three-fourths of pregnant women used an OTC pain medication at least once during pregnancy. Our findings of demographic profiles of OTC use align with results of prior studies that found higher use among non-Hispanic White women, those with higher levels of education, those with higher socioeconomic status (Haas et al., 2018), as well as low use among Hispanic women (Bercaw et al., 2010). These results highlight potential safety concerns for the developing

fetus, with 11% of women taking ibuprofen, 8% taking aspirin, and 3% taking naproxen at least once during pregnancy. Although we cannot confirm the time during pregnancy with the PRAMS data of when the OTC medication was taken, this finding gives us a signal that non-Hispanic White women may constitute an at-risk group and require additional assessment and education. Such discussion might be communicated before pregnancy and in the first, second, and third trimester appointments to introduce and reinforce OTC medication safety after 20 weeks gestation. During the third trimester of pregnancy, high levels of pregnancy pain typically occur which may cause women to take OTC medications.

There are limitations to our study. Assessment of OTC use is limited to the retrospective self-report of women who self-selected to complete the survey. Information about frequency or timing of use or whether the use was prescribed was not obtained. Because approximately 2% to 8% of pregnant women are at risk for preeclampsia, a hypertensive disorder of pregnancy, it is possible that the 8% of women who reported taking aspirin were doing so as prescribed. If prescribed, the women would be closely monitored by their health care provider for the prevention of preeclampsia and to prevent resulting fetal harm (Ives et al., 2020; U.S. Preventative Services Task Force, 2021). Based on lack of racial and ethnic diversity in Iowa, generalizability to the population of women in the United States is limited (Pew Research Center, 2016; U.S. Census Bureau, 2022). These limitations highlight the need for further study of OTC medication use in states with more ethnic diversity.

Clinical Nursing Implications

Challenges with Providing Pain Education During Pregnancy

Health care providers, including nurses, midwives, and nurse practitioners, may experience challenges with educating women about OTC pain reliever use during pregnancy. Current guidelines concerning pain management primarily suggest pain screening during the postpartum period, not during the preconception or pregnancy period (American College of Obstetricians and Gynecologists, 2018). The *Guidelines for Perinatal Care* (American Academy of Pediatrics & American College of Obstetricians and Gynecologists, 2017) recommend pregnant women consult their health care providers before taking any prescription, OTC, or herbal supplement. However, women may believe it is the health care provider who will initiate

Providing over-the-counter pain medication education before pregnancy, during the first trimester of pregnancy, 20 weeks gestation, and again at the start of their third trimester may reduce the potential for fetal risk.

a discussion about medications and therefore not bring up the subject (Lynch et al., 2017). Education about OTC pain medication is typically given during the first trimester of pregnancy and may be provided by pamphlets, medical assistants, nurses, midwives, nurse practitioners, physicians, and other health care providers. More research is necessary to further address universal clinical guidelines to assist health care providers in educating women about OTC medications during pregnancy. The CDC (2022b) is working toward this goal.

Repeated and Individualized Patient Education

Pain is prevalent in pregnant women and safe OTC pain medication use varies across the prenatal period. Assessment of pain throughout pregnancy, particularly in the third trimester provides an opportunity to discuss safe use of OTC medication. Specifically, timed assessment not only addresses the woman's well-being but also provide an opportunity to discuss risks to the fetus.

As nurses, midwives, and nurse practitioners are educators and the most trusted providers, they are well positioned to champion this new focus (Kemppainen et al., 2013). We recommend nurses, midwives, and nurse practitioners provide the OTC pain medication education to women before pregnancy and at key time points during pregnancy. Pain education may be tailored to non-Hispanic White women who use more OTC pain medications. Nurses, midwives, and nurse practitioners are ideally positioned to build rapport, support, and advocate for safe and effective prenatal care of the pain conditions women experience during pregnancy. ✚

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TABLE 3. PARTICIPANT USE OF OVER-THE-COUNTER PAIN RELIEVERS DURING PREGNANCY

	N	Weighted %	95% CI
Over-the-counter pain relievers	535	76.03	71.13–80.94
Nonrecommended over-the-counter pain relievers	150	17.43	13.32–21.55
Acetaminophen	499	71.84	66.68–77.01
Ibuprofen	105	11.12	7.72–14.52
Aspirin	50	7.96	4.97–10.96
Naproxen	21	2.96	1.07–4.85

CLINICAL IMPLICATIONS

- Nurses, midwives, and nurse practitioners are experts in providing patient education.
- Assessments of women's use of OTC pain relievers during pregnancy are needed at each prenatal care visit.
- Succinct and clear OTC pain reliever national guidelines are needed for patients, nurses, and health care providers during pregnancy to follow.
- Over-the-counter pain medication education during pregnancy may need to be introduced and reinforced for women, before pregnancy, during their first trimester of pregnancy, 20 weeks gestation, and again at the start of their third trimester to reduce the potential risk for adverse fetal outcomes.
- All women may need OTC pain reliever use education specific to their needs and beliefs during pregnancy, a vulnerable period, to reduce their levels of pain and discomfort.

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