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Research Article

Prevalence and Safety of Prescription Medicine Use During Pregnancy in the Republic of Suriname in the Year 2017: A Pharmacoepidemiological Analysis

Vinoj H. Sewberath Misser[1*], Arti Shankar[2], Ashna Hindori-Mohangoo[2,3], Jeffrey Wickliffe[2,4], Maureen Lichtveld[2,5], Dennis R.A. Mans[1]

[1]Department of Pharmacology, Anton de Kom University of Suriname, Paramaribo, Suriname;[2]Department of Medicine, Tulane University School of Public Health and Tropical Medicine, New Orleans, USA;[3]Department of Medical Sciences, Foundation for Perinatal Interventions and Research in Suriname, Paramaribo, Suriname;[4]Department of Environmental Health Sciences, University of Alabama at Birmingham, Alabama, USA;[5]Department of Health Sciences Graduate School of Public Health, University of Pittsburgh, Pittsburgh, USA

ABSTRACT

Background: Using the claims database of the State Health Foundation from 2017, the prevalence and safety of prescription medicines given to pregnant women in Suriname (South America) have been determined.

Methods: Prescription rates and proportions of the total number of prescriptions were calculated, overall and stratified for subgroups of age, region of residence, As well as major Anatomical Therapeutic Chemical and safety classification (Australian categorization system). Data were compared with the χ^2-test and the two samples test of proportions using normal theory method; p-values <0.01 were considered statistically significant differences.

Results: Average prescription rates (number of prescriptions by number of patients) were 24.0, 29.7, and 32.5 in age groups 15-29, 30-44, and 45+ years, respectively (p<0.001), and 26.4, 23.0, and 14.0 in the urban-coastal, rural-coastal, and rural-interior region, respectively (p<0.001).
The use of prescription medicines was common (rates up to 40.4), ranged from antibiotics to vitamins, and most were safe. However, 3.2% (some antibiotics and antiepileptics) belonged to safety category D, carrying a definite human fetal risk. However, the potential benefits of these drugs warranted their use in pregnant women.

Conclusion: These findings are largely in line with literature data, although future studies must verify their generalizability to the total Surinamese population.

Keywords: Suriname; Pregnant women; Claims database; Prescription medicines; Pharmacoepidemiology; Prevalence; Safety

INTRODUCTION

Pregnant women are considered a vulnerable population in medical sciences, because of the higher risk of harm to the fetus or neonate after taking medicines [1]. For these reasons, pregnant women are in general excluded from participation in clinical evaluations of new drugs and vaccines [2,3]. The thalidomide tragedy of the 1950s dramatically emphasized the reason for this policy [4]. The downside, however, is that many medications have not been tested in pregnant women, resulting in a lack of information about their possible unfavorable maternal and perinatal effects. Notably, the pharmacology of many drugs changes during pregnancy [5], data from animal studies are not always predictive for adverse effects in humans [6], and the teratogenic risks in human pregnancy have not been determined for a substantial number of approved drugs [7].

However, the use of medication by women during pregnancy is sometimes inevitable. Pregnant women are now even taking increasingly more drugs for both obstetric and non-obstetric indications [8]. In the former case, this may be associated with the increasing number of women who postpone pregnancy until after the age of 30 years [9], when the probability of developing obstetric conditions requiring pharmacotherapy is higher when

Correspondence to: Vinoj H. Sewberath Misser. Department of Pharmacology, Anton de Kom University of Suriname, Paramaribo, Suriname, Tel/Fax: +597 441071; E-mail: vinojsm@gmail.com

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compared to pregnancy at a younger age [10,11]. In the latter case, this tendency may be attributable to the rising worldwide prevalence of non-communicable diseases that, obviously, also manifests in the growing number of pregnant women with preexisting comorbidities such as diabetes mellitus, hypertension, and asthma [8]. In fact, in many parts of the world, prescription drug use is common during pregnancy, with estimates ranging from 44 to 79% in several European countries [12,13]. Common medications used during pregnancy include prescription drugs and/or over-the-counter medicines such as oral hypoglycemic, antihypertensive, and anti-asthmatic drugs as well as painkillers, antibiotics, medicines for the gastrointestinal tract, and vitamins [14]. In addition, many women use complementary, alternative, or traditional medications to ensure a healthy pregnancy and newborn [15]. However, not all medicines are safe to take during pregnancy. Angiotensin-converting enzyme inhibitors, for instance, are contraindicated during early pregnancy because of an increased risk of miscarriage [16]. The use of non-steroidal anti-inflammatory drugs such as ibuprofen and naproxen has been associated with an increased risk of miscarriage and malformations in early pregnancy and an increased risk of premature closure of the fetal ductus arteriosus and oligohydramnios after 30 weeks gestation [17,18]. And tetracycline readily crosses the blood-placenta membrane and may cause permanent discoloration of the teeth and hypoplasia of the enamel in the child when taken by the mother during the second half of pregnancy [19].

For these reasons, it is generally agreed that pregnant women should be monitored for safety of the drugs they use. A widely accepted and commonly agreed methodology to accomplish this involves pharmacoepidemiological analyses of claims databases and/or (linked) electronic medical record databases to obtain post-marketing data on the uses, efficacy, and risks of drugs in relatively large populations of pregnant women [20–23]. These approaches have identified, for instance, potential teratogenic medications in European Congenital Registers such as anti-epileptics [24] and sex hormone-based medications [25] and are therefore commonly applied to assess the prevalence and safety of prescription medicine use during pregnancy.

The Republic of Suriname is a middle-income country located on the north-east coast of South America, between French Guiana and Guyana, and bordering the Atlantic Ocean to the north and Brazil to the south. Suriname's land area of roughly 165,000 km^2 can be distinguished into a relatively narrow northern low-land area that can be subdivided into an urban-coastal and a rural-coastal region, and a southern rural-interior area that comprises about three-quarters of its surface area and largely consists of tropical rain forest [26]. Roughly 80% of the population of about 600,000 lives in the coastal regions [27], which are characterized by a western lifestyle and modern health care facilities [28]. The remaining 20% populates the rural-interior parts of the country [27] which typically has a more traditional way of living and merely offers primary care [28]. Suriname can be characterized as a demographically transitioning country with a mortality rate that has declined from 24 per 1000 in 1923 to 6 per 1000 in 2011 and a growing and aging population with an average life expectancy of 70 years in 2011 [29]. Nevertheless, the hospital-based maternal mortality rate over the past thirty years was 127 per 100,000 [30], the stillbirth rate 16 per 1000 births, and low birthweight and preterm birth rates were 15% and 14% respectively [31].

So far, there is no methodological monitoring of prescription medicine use in pregnant women in Suriname. It is therefore not clear whether these outcomes may be associated with the use of unsafe medications during pregnancy. To address the knowledge gap regarding the use of prescription medicines during pregnancy in Suriname, the current descriptive pharmacoepidemiological baseline analysis has been conducted, the outcomes of which can serve as a starting point for future research of public health interventions to increase mother and child health care. Thus, the prevalence and safety of prescription medicines dispensed to pregnant Surinamese women in the year 2017 have been assessed, both overall and after stratification according to age groups and geographical regions of residence. For this purpose, information about prescription use was retrieved from the electronic claims database of the State Health Foundation (Staatsziekenfonds, SZF), the state-owned and largest health insurance company in Suriname that includes approximately 60% of the population of Suriname [32]. The medicines dispensed have been inferred from the claimed prescriptions (detailed in methods section) and have been categorized according to the Anatomical Therapeutic Chemical (ATC) Classification System of the WHO [33] as well as the safety classifications of the Australian categorization system for prescribing medicines in pregnancy [34].

METHODS

Study population

This was a descriptive pharmacoepidemiological analysis to determine the prevalence and safety of prescription medication use in pregnant Surinamese women in the period between January 1, 2017, and December 31, 2017. Ethical approval for the study has been granted by the Institutional Review Board of the Ministry of Health of Suriname (VG 023-14) and the Institutional Review Board of Tulane University, New Orleans (LA), USA (protocol number 839093).

Sources of data

Information about the numbers of pregnant women, their date of birth and region of residence, as well as the types of medicines they had received and the medical evaluations they had undergone, were obtained from the SZF prescription claims database. All claims have manually been validated with the original paper prescriptions and paper claims [35], ensuring the soundness of the data. For the current analysis, the SZF provided information about the top 50 claimed prescriptions throughout Suriname in the year 2017 which had first been de-identified by SZF's Management Information System Department.

Data processing

Pregnant women were selected from the SZF prescription claims database based on age between 16 and 49 years, and having undergone an ultrasound related to pregnancy, as well as a HIV, hepatitis B, and a Venereal Disease Research Laboratory (VDRL) test. Selected women were stratified in three age groups (15-29, 30-44, and 45+ years) according to the reproductive health indicators of the World Health Organization [36], as well as on the basis of their region of residence (urban-coastal, rural-coastal, and rural-interior) according to the division of the Surinamese General Bureau of Statistics [27].

The prescribed medicines have been categorized according to the Anatomical Therapeutic Chemical (ATC) Classification System of the World Health Organization [33], as well as according to the Australian categorization system for prescribing medicines in pregnancy [34]. The ATC system assigns a unique code to a medicine according to organ or system on which it acts and its therapeutic, pharmacological, and chemical properties [33]. The Australian categorization system for prescribing medicines in pregnancy is based on available evidence of harmful effects of medicines on the fetus and neonate including the potential to cause birth defects, unwanted pharmacological effects around the time of birth which may or may not be reversible, as well as problems in later life [34].

For the analyses of the prevalence of prescription medicine use, numbers of prescriptions and the numbers of women claiming them has been determined, overall as well as according to age group, geographical region, and major ATC drug category. Prevalence data have been expressed as prescription rates which were calculated by dividing the overall number of prescriptions by the total number of women, or the number of prescriptions in a particular stratum by the number of women in that stratum. For the analyses of the safety of prescription medicine use, the percentages of the total number of prescriptions fitting into categories A, B, C, and D of the Australian categorization system were calculated, overall, as well as according to age group, geographical region, and major ATC drug category.

Statistics

The χ^2 test of independence was used to determine dependency among variables like regions and age groups. The proportions (%) were compared using the two samples test of proportions after testing for sample size requirements for the normal theory method. The test statistics were adjusted for multiple comparisons using the Bonferroni adjustment. All analyses have been conducted at the 0.01 level of significance to reduce type 1 error inflation based on the Bonferroni adjustment. All statistical analyses have been conducted using SPSS Version 20 and Excel from Microsoft Office 365.

RESULTS

Prevalence of prescription drug use

In the year 2017, the SZF database held 78,820 prescriptions which had been claimed by 2,983 pregnant women (Table 1). The average overall prescription rate was about 26 (Table 1). 58.0 % of the pregnant women were aged between 15 and 29 years, 40.9% were 30 to 44 years old, and 1.1 % were 45 years or older (Table 1). This led to a median (IQR) age of the women of 28 (22-33) years (mean 28,2 years (SD 7). Average prescription rates in age groups 15-29 years, 30-44 years, and 45+ years were 24.0, 29.7, and 32.5, respectively, per woman. The differences among age groups 15-29 years and 30-44 years were statistically significant ($p<0.001$).

Around 65% of the prescriptions were for women living in Suriname's urban-coastal region, less than 20% for women in the country's rural coastal region, and about 5% for women in the rural-interior (Table 1). Average prescription rates were 26.4, 23.0, and 14.0 per woman in the urban-coastal, rural-coastal, and rural-interior region, respectively (Table 1). The difference between prescription rates in the urban-coastal and rural-coastal regions was relatively small, but significant ($p=0.004$), while that between the coastal regions on the one hand and the rural-interior areas on the other hand was much higher ($p<0.001$).

Most frequently used medicine categories

As shown in Table 2, drugs for the alimentary tract and metabolism (A), respiratory system (R), and nervous system (N) as well as systemic hormonal preparations, excluding sex hormones and insulin (H), had been prescribed at rates of on average 33.7 to 40.4 per woman. These drugs mainly consisted of vitamins, Drugs for various gastrointestinal disorders, several respiratory products, cough and cold medicines, and nasal preparations; analgesics; as well as a relatively small number of corticosteroids for systemic use. Together, these prescriptions comprised almost 50% of the total number (Table 2), indicating that these drugs were among the most intensively prescribed for pregnant Surinamese women in 2017.

The second most frequently prescribed drugs for the pregnant Surinamese women in 2017 were drugs for the blood and blood-forming organs (B), cardiovascular system (C), and musculo-skeletal system (M) as well as dermatologicals (D). These compounds have been prescribed at rates of 23.2 to 28.0 (Table 2). They mostly included anti-anemic drugs; anti-hypertensive drugs, anti-inflammatory and antirheumatic products and topical products for joint and muscular pain, as well as antifungals and corticosteroids for dermatological use. These prescriptions made up about one-third of the total number, with those for the anti-anemics alone representing more than 20% (Table 2).

Drugs for the genito-urinary system and sex hormones (G), anti-infectives for systemic use (J), antiparasitic products, insecticides and repellents (P), and drugs for the sensory organs (S) were prescribed at average rates of 15.5 to 19.5 per woman (Table 2). These medicines consisted of sex hormones and modulators of the genital system; antibacterials and antifungals for systemic use; anthelmintics; and ophthalmologicals. Together, these prescriptions accounted for 13.9% of the total number with antibacterials and antifungals alone accounting for 8.2% (Table 2).

Safety of prescription drug use

As shown in Table 3, 67.6 % of overall prescriptions were for drugs of categories A and B of the Australian categorization system for prescribing medicines in pregnancy (52.4 and 15.2%, respectively; Table 3). Category A and B drugs are considered safe for pregnant women and women of childbearing age and are not associated with harmful effects on the human fetus [34]. Eight percent of overall prescriptions were for drugs of safety category C (Table 3, i.e., drugs which have caused or may cause reversible harmful effects on the human fetus or neonate [34]. However, 3.2% of the prescriptions were for drugs of category D, which have a reasonable probability of causing irreversible damage to the fetus [34]. Thus, although most of the prescriptions for pregnant women were for drugs considered safe to fairly safe, a relatively small number was for compounds that may be harmful to the fetus.

In each safety category, about half of the prescriptions were for women aged 15 - 29 years, about half for women of 30 - 44 years, and only a very small number for the relative handful of pregnant women of 45+ years (Table 3). This pattern was in line with the age distribution of pregnant women mentioned above (Table 1) (i.e., women in age groups 15 - 29 years, 30 - 44 years, and 45+ years comprising 58.0, 40.9, and 1.1%, respectively, of the total number of pregnant women; Table 1). Notably, prescriptions for drugs in the relatively unsafe category D were given to 3.1% of women who were younger than 45 years (Table 3).

Table 1: Number of prescriptions to pregnant women and number of pregnant women in Suriname in 2017, overall as well as stratified according to age group and region of residence

	Number of prescriptions (%)	Number of pregnant women (%)	Prescription rate
Total number	78,820	2,983 (100%)	26.4
Age group			
15-29 years	41,443 (52,6%)	1,729 (58.0%)	24.0
30-44 years	36,272 (46.0%)	1,220 (40.9%)	29.7
45+ years	1,105 (1.4%)	34 (1.1%)	32.5
Region of residence			
Urban-coastal	51,561 (65.4%)	1,951 (65.4%)	26.4
Rural-coastal	12,458 (15.8%)	541 (18.1%)	23.0
Rural interior	4,315 (5.5%)	308 (10.3%)	14.0
Missing	10,486 (13,3%)	183 (6.1%)	57.3

Note: Two samples test of proportions after testing for sample size requirements for the normal theory method after Bonferroni adjustment ($p<0.01$):'15-29 years vs 30-44 years $p<0.001$; 'Urban-coastal' vs 'Rural-coastal' $p=0.004$; 'Urban-coastal' vs 'Rural-interior' $p<0.001$;'Rural- coastal' vs 'Rural-interior' $p<0.001$.

Table 2: Total number of prescriptions to pregnant women, total number of pregnant women and prescription rate in Suriname in 2017, categorized by major ATC group.

Major ATC group	Number of prescriptions	Number of pregnant women	Prescription rate
Total	77,870 (100%)	2,737	28.5
Alimentary tract and metabolism (A)	17,548 (22.5%)	434	40.4
Blood and blood forming organs (B)	16,022 (20.6%)	692	23.2
Cardiovascular system (C)	2,603 (3.3%)	93	28.0
Dermatologicals (D)	6,880 (8.8%)	260	26.5
Genito-urinary system and sex hormones (G)	1,738 (2.2%)	99	17.6
Systemic hormonal preparations, excl. sex hormones and insulins (H)	438 (0.6%)	13	33.7
Antiinfectives for systemic use (J)	6,371 (8.2%)	326	19.5
Musculo-skeletal system (M)	2,953 (3.8%)	109	27.1
Nervous system (N)	10,086 (13.0%)	276	36.5
Antiparasitic products, insecticides and repellents (P)	680 (0.9%)	4	15.5
Respiratory system (R)	10,517 (13.5%)	284	37.0
Sensory organs (S)	2,034 (2.6%)	107	19.0

Note: Two samples test of proportions after testing for sample size requirements for the normal theory method after Bonferroni adjustment ($p<0.01$): A vs B, A vs C, A vs D, A vs G, A vs J, A vs M, A vs P, A vs S: $p<0.001$; , B vs N and B vs R: $p<0.001$; C vs G and C vs H: $p<0.001$, C vs J: $p=0.005$; C vs S: $p=0.005$; D vs G: $p=0.001$, D vs J, D vs M, D vs P and D vs S: $p<0.001$; D vs R: $p=0.001$; G vs R: $p<0.001$; J vs N and J vs R: $p<0.001$;M vs N, M vs P, M vs R, M vs S: $p<0.001$;P vs R: $p<0.001$;R vs S: $p<0.001$.

Table 3: Proportion of total number of prescriptions (N=78820) according to safety categories (Australian categorization system), stratified by age groups and region of residence.

	Percentage of total number of prescriptions according to Australian categorization system for prescribing medicines in pregnancy				
	A	B	C	D	Exempt
Subtotal	52.4%	15.2%	8.0%	3.2%	20.6%
Age group					
15-29 years	28.7%	7.8%	3.3%	1.6%	10.8%
30-44 years	23.3%	7.2%	4.3%	1.5%	9.4%
45+ years	0.3%	0.2%	0.4%	0.1%	0.4%
Region of residence					
Urban-coastal	33.8%	10.1%	5.6%	2.2%	13.4%
Rural-coastal	8.3%	2.6%	1.1%	0.5%	3.3%
Rural-interior	3.1%	0.7%	0.3%	0.2%	1.0%
Missing	7.1%	1.9%	1.0%	0.4%	2.9%

Note: All pairwise comparisons differ significantly with $p<0.001$.

Table 4: Proportions of total number of prescriptions (N=77819) according to safety categories (Australian categorization system), categorized by major ATC group.

Major ATC group	Proportion (%) of total prescriptions (N=77819) of drugs by Australian safety level				
	Category A	Category B	Category C	Category D	Exempt
Alimentary tract and metabolism (A)	8.3%	6.0%	0.3%	0.0%	7.9%
Blood and blood forming organs (B)	17.4%	0.8%	0.3%	0.0%	2.1%
Cardiovascular system (C)	1.5%	0.0%	1.2%	0.3%	0.4%
Dermatologicals (D)	4.5%	1.7%	0.1%	0.2%	2.4%
Genito urinary system and sex hormones (G)	0.0%	1.4%	0.0%	0.8%	0.0%
Systemic hormonal preparations, excl. sex hormones and insulins (H)	0.5%	0.1%	0.0%	0.0%	0.0%
Antiinfectives for systemic use (J)	5.3%	1.8%	0.3%	0.6%	0.2%
Musculo-skeletal system (M)	0.0%	0.1%	1.9%	0.0%	1.8%
Nervous system (N)	11.1%	0.3%	1.3%	0.1%	0.1%
Antiparasitic products, insecticides, and repellents (P)	0.0%	0.8%	0.0%	0.1%	0.0%
Respiratory system (R)	4.6%	1.9%	2.6%	0.0%	4.5%
Sensory organs (S)	0.0%	8.0%	8.0%	8.0%	8.0%
0.0%	0.0%	0.4%	8.0%	8.0%	8.0%

Note: All pairwise comparisons differ significantly with $p<0.001$.

Similarly, in each safety category, most prescriptions were for women living in the urban-coastal region of Suriname (Table 3), with about 3x and 10x fewer prescriptions for women from the rural-coastal and rural interior regions, respectively (Table 3). This ratio was roughly in line with the regional distribution of prescriptions of 65.4% for urban-coastal women, 18.1% for rural-coastal women, and 10.3% for rural-interior women (Table 1). The relatively large number of prescriptions for urban-coastal women was also the reason for the relatively large proportion (2.2%) of women receiving prescriptions for the harmful category D drugs when compared to rural- coastal (0.5%) and rural- interior women (0.2%).

Safety of most frequently used medicine categories

The most frequently prescribed ATC drug categories (drugs for the alimentary tract and metabolism, respiratory system, and nervous system as well as systemic hormonal preparations, excluding sex hormones and insulin; Table 2) were safe to fairly safe according to the Australian categorization system for prescribing medicines in pregnancy. As shown in Table 4, 24.5% of all these prescriptions together were for drugs in the safety category A, 8.3% for drugs in the reasonably safe category B, 4.2% for drugs in the fairly safe category C, and only 0.1% for drugs in the potentially harmful category D (Table 4). The latter compounds mainly consisted of analgesics.

The majority of the second most frequently prescribed drug categories (drugs for the blood and blood-forming organs, cardiovascular system, and musculo-skeletal system as well as dermatologicals; Table 2) were also safe to fairly safe. Table 4 shows that 23.4% of all these prescriptions together were for drugs in the Australian safety category A, 2.6% for drugs in category B, 3.5% for driugs in category C, and 0.5% for drugs in the unsafe category D (Table 4). The latter compounds mainly included agents acting on renin-angiotensin-aldosterrone-system (RAAS) as well as antibiotics and chemotherapeutics for dermatological use.

About 10% of the least frequently prescribed drug categories (drugs for the genito-urinary system and sex hormones, anti-infectives for systemic use, antiparasitic products, insecticides, and repellents and drugs for the sensory organs; Table 2) was in the Australian safety categories A, B, and C (Table 4). A little over 5% could be regarded as safe, 4.4% as reasonably safe, 0.4% as fairly safe, but 2.8% as potentially detrimental to the fetus (Table 4). The latter drugs mainly comprised sex hormones and modulators of the genital system, antibacterials for systemic use, antiepileptics, anthelminthics as well as ophthalmological and otological preparations.

Approximately 17% of the total number of prescriptions was for drugs in the category 'exempt' (Table 4), meaning that the drugs were exempted from the requirements to be registered or listed, or exempted from licensing requirements by the Australian government. These compounds included some drugs for gastrointestinal conditions, a few anti-anemic preparations, certain antimicrobial compounds for dermatological use, several topical products for joint and muscular pain, as well as a number of nasal preparations and cough and cold preparations.

DISCUSSION

In this analysis, the prevalence and safety of prescription medicine use by pregnant Surinamese women in 2017 have been evaluated. The results showed an average overall prescription rate of about

26, an increasing prescription rate with older age, and a higher prescription rate in Suriname's urban-coastal and rural-coastal regions when compared to the rural-interior part of the country. The most frequently prescribed medicine categories according to the ATC Classification System of the WHO [33] have also been determined. The majority of prescriptions were for drugs of categories A, B, and C of the Australian categorization system for prescribing medicines in pregnancy [34] which are considered safe to fairly safe for the human fetus or neonate [34]. However, 3.2% of the prescriptions were for drugs of category D, which have a reasonable probability of causing serious damage to the fetus [34]. Prescriptions for drugs in the latter category were given to 3.1% of women who were younger than 45 years and 2.2% of women from the urban-coastal region of Suriname, and included some analgesics, antihypertensives, and dermatologicals, as well as a few ophthalmological and otological preparations, sex hormones and modulators of the genital system, antibacterials for systemic use, and anthelmintics.

The overall prescription rate of 26.4 found for pregnant Surinamese women in the current analysis was substantially higher than values reported in the literature. For instance, the average number of prescriptions for pregnant women in the city of Natal (RS) in Brazil was 2.4 [37], that for pregnant women in the Jazan region in Saudi Arabia was 3.3 [38], and that for those in the province of British Columbia in Canada was 5.3 [39]. On the other hand, in several European countries, prescription drug use during pregnancy has been estimated at 27 - 99% [40]. These apparent discrepancies are attributable to the different approaches for reporting medicine use during pregnancy, including average number of medications during pregnancy [8], average number of prescriptions per pregnancy [39-41]; and prescription rates [40]. Such discrepancies warrant a need to uniformly measure and report (prescription) medicine use in order to make meaningful comparisons.

The average age of 28 years (SD 7) of the pregnant women noted in the current analysis is within the international age range (26-32 years) [9-42] of women giving birth. As mentioned above, increasingly more women are delaying having children [9]. This can partially be explained by the increasing number of women pursuing higher-education studies [43,44], a phenomenon that is also seen in Suriname, where females in secondary and tertiary education even outnumber males by a factor of 2 to 3 [27]. Two possible consequences of this socioeconomic shift are a higher use of medications and a higher prescription rate in older pregnant women when compared to younger women [45] and an increased risk of adverse maternal and perinatal effects during pregnancy at a later age [46,47].

The lower prescription rate for women from the rural-interior region when compared to those from the coastal regions is probably attributable, in part, to the substantial number of uninsured women in the former group who have not been included in the current analysis [48]. These women are taken care of by the Medical Mission Primary Healthcare Suriname [48], a government-subsidized, non-governmental organization that provides primary health care to the inhabitants of the interior of Suriname regardless of their health insurance status [48]. In addition, Suriname's urban-coastal and rural-coastal inhabitants represent the largest section of the Surinamese population [27] and the largest proportion of SZF's clients [32], further explaining the difference in prescription rates between the coastal areas and the interior. Notably, medical care in Suriname's entire coastal region is provided by general practitioners and the publicly funded Regional Health Services whose patients are governmentally insured [32], most likely accounting for the comparable prescription rates for the urban-coastal and rural-coastal regions seen in the current analysis.

The most frequently prescribed medicine categories were for drugs for the alimentary tract and metabolism, respiratory system, and nervous system, as well as systemic hormonal preparations, excluding sex hormones and insulins. These were followed by drugs for the blood and blood-forming organs, cardiovascular system, and musculo-skeletal system, as well as dermatologicals. The third most frequently prescribed drugs were drugs for the genito-urinary system and sex hormones, anti-infectives for systemic use, antiparasitic products, insecticides and repellents, and drugs for the sensory organs. These findings are in line with those from studies from other parts of the world. For instance, a Canadian study found that antibiotics and antiemetics were the most commonly prescribed medications for pregnant women [49]. A French analysis mentioned that this was the case for analgesics, anti-anemic preparations, and drugs for gastrointestinal disorders [50]. A Norwegian evaluation concluded that this held true for drugs for the alimentary tract, blood and blood forming organs, and respiratory organs, anti-infectives for systemic use, as well as drugs for the genito-urinary system and sex hormones [13].

That the majority (around 75%) of overall prescriptions for the pregnant Suriname women were for drugs considered safe to fairly safe for the fetus or neonate [34], is in accordance with the results from a Brazilian [20] and a European study [51] on the safety of drug use during pregnancy. About 3.2% of the prescriptions were for drugs of safety category D (i.e., compounds known to cause serious damage to the fetus or neonate) [34]. This value is well in accordance with that reported for Taiwan 1.1% [52], The Netherlands 2.4% [12], the USA 4.6% [53], China 5% [54], and Saskatchewan, Canada 5.2% [55]. In all these cases, the category-D drugs were mostly given to women suffering from (chronic) conditions related to pregnancy [12] or age-related risks of maternal morbidity such as renal failure, cardiovascular morbidity, or gestational diabetes [46,47].

The greater number of women in the coastal regions who had received drugs in the safety category D when compared to the rural-interior region can probably be attributed to the greater population density in the former parts of Suriname when compared to the latter [56]. In addition, pregnant women from the rural-interior region who require more intensive treatment - including the administration of category-D drugs - are often transferred to facilities in the coastal region that offer more advanced therapeutic modalities [28]. These women might not have been included in the current stratum of rural - interior women which might have contributed to the observed relatively large differences with the coastal strata. Obviously, this assumption must be verified in future studies that include evaluations of the medical records of the women.

The proportion of the potentially harmful category-D drugs was rather diverse and included analgesics, antihypertensives, dermatologicals, sex hormones and modulators of the genital system, antibacterials for systemic use, antiepileptics, anthelmintics, as well as ophthalmological and otological preparations. Although it is generally agreed that the use of these medicines should be avoided during pregnancy, they may be clinically indicated for pregnant women. This particularly holds true for analgesics [17-57], antihypertensives [58], and antibiotics [59,60]. These drugs are

among the most commonly prescribed medicines during pregnancy [61,62] and are administered after strict consideration and under close monitoring [59,60]. Potentially harmful antiepileptics, anthelminthics, as well as ophthalmological and otological preparations have been prescribed at lesser rates, and their use during pregnancy has previously been reported in Sweden [63] and Norway [64].

CONCLUSIONS

Summarizing, the results from the current analysis indicate that the overall prescription rate for pregnant Surinamese women was 26.4. The prescription rate increased with older age and was higher for women in the coastal region than for those in the interior. Furthermore, most prescriptions were for common ailments ranging from conditions of the alimentary tract and metabolism and respiratory system to drugs for the musculo-skeletal system and cardiovascular system. Most of these drugs were safe to fairly safe, but a relatively small number might cause damage to the vulnerable fetus and the neonate. Among the latter compounds were potentially harmful drugs that are given to pregnant women under specific conditions such as, among others, some analgesics, anti-infectives for systemic use, and antiparasitic products.

These data underline the importance of scientifically obtained data to monitor prescription medicine use in pregnant women, and the usefulness of pharmacoepidemiological evaluations to obtain these data. However, it should be taken into account that the current analysis was based on data from the 2,943 registered pregnant women in the SZF database while there were approximately 9,000 births in Suriname in 2017 [31]. Additionally, the exact number of pregnant women from Suriname's interior is not known [48].

There was, furthermore, no information about the trimester the medicines had been prescribed or about the compliance with which they had been taken. Potential drug-drug interactions have also not been considered in the current analysis. The same holds true for potential interactions between non-prescription medications (such as over-the-counter medicines and traditional forms of treatment) with the prescription drugs. These limitations warrant some caution about the generalizability of the current data on the prevalence and safety of prescription drug use by pregnant women in Suriname. Notwithstanding, the current approach shows a feasible way to go forward to evaluate the use of prescription medicines during pregnancy, conceivably with supporting data from medical records and hence lead to more research and public health interventions to increase mother and child safety.

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CONFLICT OF INTEREST

None to report

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