Women sociodemographic characteristics, lifestyle habits and the use of medications during pregnancy: a cohort study

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Abstract

Purpose: Medication use during pregnancy has been associated with women’s socioeconomic status and lifestyle habits, but maternal health status has hardly been accounted for. We evaluated the association of prescription medication use with sociodemographic characteristics and lifestyle habits in a cohort of pregnant women, adjusting for comorbidities.

Methods: Pregnant women recruited in a prenatal clinic in Trieste, Italy, 2007 to 2009, filled a questionnaire. Prescription data were obtained from pharmacy database through record linkage. Adjusted unconditional logistic regression Odds Ratio (aOR), with 95% confidence interval (95%CI), of having ≥ 1 dispensing for (a) any medication, (b) folic acid and/or iron was calculated.

Results: Among 767 women, 70.5% had ≥ 1 dispensing for any medication, 46.1% of folic acid/iron. For any medication, the aOR (95%CI) was strongly associated with age (<25 years 2.08; 0.92-4.72, ≥40 years 2.30; 1.10-4.81 vs. 29-34 years). Women with lower education (high school 1.23; 0.76-2.00 vs. university) immigrant or with immigrant partner (1.48; 0.76-2.85 vs. non-immigrant), unemployed (1.38; 0.74-2.57 vs. employed in maternity leave), with lowest or highest BMI (1.35; 0.70-2.63 and 1.20; 0.57-2.56 vs. normal) were more likely to use medications. Women with lower education were less likely to use folic acid/iron (high school 0.80; 0.56-1.15, <high school 0.65; 0.40-1.08 vs. university)

Conclusions: In this cohort, sociodemographic characteristics were independently associated with use of medication when comorbidities were adjusted for. Care providers should thus target women with low educational level in promoting folic and iron supplementation during pregnancy.

Background

Women frequently use medications during pregnancy. The prevalence of use of prescription medications ranged from 27% to 99% in developed countries [1] and it was about 67% for Over-the-Counter (OTC) agents [2]. The evidence on the risk–benefit profile in pregnant women is limited to few post-approval studies for most medications, as pregnant women are not included in clinical trials. Thus pregnant women often have concerns about using medicines [3] and their compliance with even needed pharmacologic treatments may be influenced by the perception of medication-related risk: about 70% of women reportedly avoided to take a medication for fear of foetal adverse effects [4]. Sociodemographic differences in risk perception have been reported: young maternal age, low educational level and being at first pregnancy have been associated with an increased perceived risk for both prescription and Over The Counter (OTC) medications [5].

Sociodemographic characteristics and lifestyle habits have indeed been associated with the use of medications during pregnancy, even though with some inconsistencies. A number of studies reported that use of medications increases with increasing maternal age [2,6,7], however younger pregnant women were more likely to report use of medications for acute/short-term illnesses [2] and anti-asthmatics [8], and of filling prescriptions of antibiotics [9]. Use of medications was inversely associated with maternal [2,8,10] and paternal [2,10] education in some studies, but in a large US cohort the use of prescription medication increased with maternal education [6]. Immigrant women in Western and Northern Europe were less likely to report medications for chronic/long-term disorders than not immigrant women [2]. In Belgium, medication use has been positively associated with Western origin, being born in the country, high education and being employed [7]. Unemployed women were more likely to report use of medications with potential for fetal harm (vs. professional/manager) [11]. Welfare recipients and unemployed were more likely to use antibiotics (vs. white/blue collar workers) [9]. Smoking [2,8] and alcohol consumption during pregnancy [2,11] have been positively associated with medications use, and obesity with the use of anti-asthmatics [8].

Maternal health status is a strong determinant of medication use. Women reporting health problems during the pregnancy were more likely to use analgesics, anti-infectives and antihistamines than those who did not report problems [12]. Sociodemographic characteristics and lifestyle habits have a complex relation with maternal health status as well as with health care utilization during pregnancy, such as prenatal care visits and ultrasound evaluations. For instance, maternal education

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has been inversely associated with hypertension and preterm delivery [13-16] as well as with obesity [17]. A social gradient in lifestyle habits, such as smoking during pregnancy [13,18] has been reported as well. Few prior studies, however, took into account maternal health status in assessing the relation between medication use and the characteristics of the women. This prospective cohort study evaluated the association of prescription medication use with sociodemographic characteristics and lifestyle habits, adjusting for comorbidities before and during pregnancy. Moreover we evaluated the relation between medication use and indicators of health care utilization during pregnancy.

Methods

Study cohort

The cohort included all pregnant women resident of Friuli Venezia Giulia (FVG) region, Northeast Italy, attending their prenatal visit between 20 and 22 weeks of gestation at the Institute for Maternal and Child Health IRCCS Burlo Garofolo, in Trieste, from April 3, 2007 to March 3, 2009. During the recruitment period, about 1,800 live births per year were recorded in Trieste and 9,000 in FVG [19]. Exclusion criteria were: age <18 years, Italian language not fluent, twin or complicated pregnancies defined as those with maternal abnormalities of the reproductive tract (such as uterine fibroids, pre-existing chronic illness such as cancer, AIDS, severe heart disease, severe kidney disease, severe Crohn's disease or ulcerative colitis) and those with foetal congenital defects.

All the women filled a self-administered questionnaire inquiring on: date of birth, marital status (woman cohabiting with the partner or living alone), house size (<50 m², 50-100 m², 100+ m²), smoking, alcohol consumption, comorbidities before and during pregnancy (diabetes, asthma, allergy, epilepsy, hypertension, vomit, hypothyroidism, hyperthyroidism, lupus, rheumatic diseases, urinary infections, infections, fever, seizures, anemia, cardiovascular diseases, neurological diseases), prior pregnancies (gravidity), number of prenatal visits and ultrasound examinations, height and weight before and during pregnancy, gestational age at birth and date of delivery. For both the woman and her partner information on country of origin, level of education (degree achieved: less than high school, high school, university or higher) and occupational status (employed in maternity leave, employed, housewife, unemployed) was collected.

Prescription data

For each woman, through record linkage using an individual identifier, we extracted the records of all prescriptions redeemed between 2006 and 2012 from the outpatient prescription database of the FVG Region. This database records prescriptions at pharmacy redemption level. It captures all redeemed prescriptions for reimbursed medications dispensed to residents of the region. A unique personal identifier links anonymized individual records. Prescription medications are reimbursed to residents, including pregnant women. All residents are registered with the Regional Health System, providing universal access to health care.

For each redeemed prescription, the following information is recorded: date of redemption, active substance (description and Anatomical Therapeutic and Chemical ATC classification code) [20], brand, quantity, strength, dispensed form, number of units and number of refills. Information on the indication and the prescribed dosage regimen is not recorded.

All prescriptions redeemed from the estimated date of conception to the date of delivery were considered to have occurred during pregnancy. The estimated date of conception was obtained by subtracting gestational age at birth from the date of delivery.

Statistical analysis

Unconditional logistic regression Odds Ratio (OR), with 95% confidence interval (95%CI), of redeeming ≥ 1 prescription (a) of any medication, (b) of any medication excluding folic acid and iron and (c) of systemic antibiotics (ATC J01) was calculated. The following variables were evaluated through uni- and multi-variate analysis: age at delivery (5 classes), education of the women and partner, occupational status of the women and partner, prior pregnancies, smoking, alcohol consumption, BMI before pregnancy (underweight below 18.5; normal weight 18.5-24.9; overweight 25.0-29.9; obesity 30.0 and more) [21], comorbidities before and during pregnancy (none; 1; 2+), country of origin of the women and partner (Italy, other), marital status, number of visits and of ultrasound imaging, house size. The manual process of multivariate model building included entering individual terms and evaluating the likelihood ratio test for inclusion of each variable in the model. Variables with at least one modality had Wald p ≥0.20 were entered individually in multivariate models and only those with p<0.05 or explained the variability or modified the regression coefficient estimators were retained. Two final multivariate models were fitted: one adjusting for age, paternal education, ultrasound imaging and one adding comorbidities as well. Stratified analysis according to reported comorbidities (yes/no) were performed. The statistical analysis was performed with SAS® software, version 9.3 (SAS, Cary, NC, USA).

Ethics Committee review

The study protocol was reviewed by the Ethics Committees at the University Hospital of Udine and at the Institute for Maternal and Child Health of Trieste. Written informed consent for participation in the study was obtained.

Results

Out of 767 women included, 70.5% (N= 541) had at least one dispensing for any medication during pregnancy (Table 1). Folic acid (36.0%) and iron (26.2%) were the most common medications, followed by non-opioid analgesics (6.2%), thyroid hormones (4.3%), medications for acid related disorders (3.6%) and antithrombotics (3.2%).

When adjusting for age, partner education and house size, the OR of having at least one dispensing during pregnancy was directly associated with comorbidities (one 1.72; 95%CI 1.17-2.54; 2 or more 1.96; 95%CI 1.30-2.94), BMI in the lowest (1.27; 95%CI 0.68-2.37) and highest (1.28; 95%CI 0.60-2.73) category, immigrant status of the woman (1.41; 95%CI 0.74-2.68; of the partner 1.42; 95%CI 0.67-3.01), being housewife (1.23; 95%CI 0.68-2.22) or unemployed (1.67; 95%CI 0.87-3.21), having an unemployed partner (1.20; 95%CI 0.54-2.65) (Table 2). Conversely, a decreased OR was associated with current employment (0.80; 95%CI 0.44-1.46) and being single (0.82; 95%CI 0.46-1.45).

The results did not change when prescription of folic acid and iron were excluded (Table 3). When only prescriptions for folic acid and iron were considered, an inverse association with obesity (0.67; 95%CI 0.35-1.32) and educational level of the women (< high school 0.61; 95%CI 0.37-0.99; high school 0.75; 95%CI 0.53-1.07), but not of the partner was found (Table 4).

Women immigrant status (3.12; 95%CI 0.77-12.75), lower educational level (< high school 2.11; 95%CI 0.82-5.44; high school 1.26; 95%CI 0.63-2.52) and BMI in the lowest (4.08; 95%CI 1.02-16.36)
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Table 1. Number of women with at least one dispensing during pregnancy, by therapeutic class.

| Therapeutic class                                             | ATC1 | N   | %  |
|---------------------------------------------------------------|------|-----|----|
| **alimentary tract and metabolism**                           |      |     |    |
| medications for acid related disorders                       | A02  | 27  | 3.6|
| antacids                                                      | A02A | 21  | 2.8|
| medications for peptic ulcer and gastro-esophageal reflux    | A02B | 7   | 0.9|
| medications for functional gastrointestinal disorders          | A03  | 12  | 1.6|
| bile and liver therapy                                        | A05  | 2   | 0.3|
| laxatives and anti diarrheals                                 | A06  | 4   | 0.5|
| insulin                                                       | A10A | 1   | 0.1|
| vitamins and mineral supplements                              | A11, A12 | 18 | 2.4|
| **blood and blood forming organs**                            |      |     |    |
| antithrombotic agents                                         | B01  | 24  | 3.2|
| heparins                                                      | B01AB | 14 | 1.8|
| platelet aggregation inhibitors                               | B01AC | 14 | 1.8|
| antihemorrhagics                                              | B02  | 0   | -  |
| iron                                                          | B03A | 199 | 26.2|
| folic acid                                                    | B03B | 273 | 36.0|
| solutions                                                     | B05BB | 0  | -  |
| **cardiovascular system**                                     |      |     |    |
| antihypertensive medications                                 | C02, C07, C08, C09A | 6 | 0.8|
| methyldopa                                                    | C02  | 0   | -  |
| beta-blocking agents                                          | C07  | 3   | 0.4|
| calcium channel blockers                                      | C08  | 5   | 0.7|
| angiotensin inhibitors                                        | C09A | 0   | -  |
| lipid modifying agents                                        | C10A | 0   | -  |
| diuretics                                                     | C03  | 0   | -  |
| vasoprotectives                                               | C05C | 2   | 0.3|
| **genito-urinary system and sex hormones**                    |      |     |    |
| gynecological antiinfectives - antiseptics                   | G01A | 7   | 0.9|
| sympathomimetics, labour repressants                          | G02CA | 10 | 1.3|
| prolactin inhibitors                                          | G02CB | 0 | -  |
| hormonal contraceptives                                        | G03A | 0   | -  |
| estrogens                                                     | G03C | 0   | -  |
| progesterones                                                 | G03D | 19  | 2.5|
| gonadotrophins                                                | G03G | 0   | -  |
| **systemic hormonal preparations**                            |      |     |    |
| glucocorticoid, systemic                                      | H02A | 5   | 0.7|
| thyroid preparations                                          | H03  | 35  | 4.6|
| thyroid hormones                                              | H03A | 33  | 4.3|
| antithyroid preparations                                      | H03B | 2   | 0.3|
| **anti-infective agents**                                     |      |     |    |
| antibiotics, systemic                                         | J01  | 20  | 2.6|
| antimycotics, systemic                                        | J02  | 1   | 0.1|
| antivirals, systemic                                          | J05  | 1   | 0.1|
| immune sera and immunoglobulins                               | J06B | 0   | -  |
| **musculo-skeletal system**                                   |      |     |    |
| non-steroidal anti-inflammatory drugs                         | M01A | 2   | 0.3|
| bisphosphonates                                               | M05B | 0   | -  |
| **nervous system**                                            |      |     |    |
| non-opioid analgesics                                         | N02BE | 47 | 6.2|
| selective serotonin agonists                                  | N02CC | 1 | 0.1|
| antiepileptic medications                                     | N03  | 1   | 0.1|
| antidepressants                                               | N06A | 0   | -  |
| methadone                                                     | N07B | 0   | -  |
| **antiparasitic products**                                    |      |     |    |
| antiprotozoals and antinematodals                             | P01  | 0   | -  |
| **respiratory system**                                        |      |     |    |
| medications for obstructive airway disease                    | R03  | 7   | 0.9|
| adrenergic inhalants                                          | R03A | 5   | 0.7|
| other inhalants                                               | R03B | 1   | 0.1|

*Table 1. Number of women with at least one dispensing during pregnancy, by therapeutic class.*

*Users (N=541)*
Table 2. Odds Ratios (OR), with 95% Confidence Interval (95%CI), of having at least one dispensing for any medication during pregnancy, by socio-demographic characteristics.

| Age category (years) | dispensing for any medication during pregnancy | univariate | multivariate$^1$ | multivariate$^2$ |
|----------------------|-----------------------------------------------|------------|------------------|------------------|
|                      | at least one (N= 541)                         | OR | 95%CI | OR | 95%CI | OR | 95%CI |
| <25                  |                                               | 1.78 | 0.81-3.91 | 2.42 | 1.01-5.83 | 2.96 | 1.17-7.45 |
| 25-29$^4$            |                                               | 1.69 | 0.69-2.66 | 1.85 | 1.16-2.93 | 2.01 | 1.25-3.24 |
| 30-34                |                                               | 1.44 | 0.89-2.31 | 1.58 | 0.97-2.58 | 1.72 | 1.04-2.84 |
| 40+                  |                                               | 2.19 | 1.06-4.52 | 2.99 | 1.37-6.52 | 3.18 | 1.44-7.05 |
| Country of origin    |                                               |       |        |       |        |       |        |
| Italy$^3$            |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| Other                |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| Partner country of origin |                       | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| Marital status       |                                               |       |        |       |        |       |        |
| Married$^3$          |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| Single               |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| Women level of education (degree achieved) |   |       |        |       |        |       |        |
| Less than high school|                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| High school          |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| University$^3$       |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| Partner level of education (degree achieved) |   |       |        |       |        |       |        |
| Less than high school|                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| High school          |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| University$^3$       |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| Occupational status  |                                               |       |        |       |        |       |        |
| Employed in maternity leave$^2$ |   | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| Employed             |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| Housewife            |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| Unemployed           |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| Partner occupational status |                     | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| Employed$^3$         |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| Unemployed           |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| Smoking              |                                               |       |        |       |        |       |        |
| Never$^4$            |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| Smoker               |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| Ex smoker            |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| Alcohol consumption (drinks/week) |                     |       |        |       |        |       |        |
| Abstainer$^3$        |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| <=4                  |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| >4                   |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| BMI (kg/m2)          |                                               |       |        |       |        |       |        |
| <18.50 underweight   |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| 18.50-24.99 normal$^5$|   | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| 25-30 overweight     |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| >30 obese            |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| Prior pregnancies    |                                               |       |        |       |        |       |        |
| 1                    |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |
| 1 to 2               |                                               | 1.00 | - -    | 1.00 | - -    | 1.00 | - -    |

$^1$ Anatomic and Therapeutic Classification.
$^3$ Percentage of the total number of cohort members.

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| Table 3. Odds Ratio (OR), with 95% Confidence Interval (95%CI), of redeeming at least one prescription of any medication excluding folic acid and iron during pregnancy, by sociodemographic characteristics. |
|---------------------------------|-----------------|-----------------|------------------|------------------|
| prescription redemption | no (N= 226) | yes (N= 359) | univariate | age-adjusted | multivariate* | multivariate* |
| N | % | N | % | OR | 95%CI | OR | 95%CI | OR | 95%CI | OR | 95%CI |
| age category (years) | | | | | | | | | | | | |
| <25 | 11.2 | 4.87 | 20 | 5.57 | 1.96 | 0.83 | 4.58 | - | - | - | - | 2.57 | 1.00 | 6.61 | 2.93 | 1.08 | 7.94 |
| 25-39 | 43.0 | 19.03 | 40 | 11.14 | 1.00 | - | - | - | - | - | - | 1.00 | - | - | - | - |
| 30-34 | 89.38 | 151 | 42.06 | 1.82 | 1.10 | 3.02 | - | - | - | - | 2.02 | 1.21 | 3.37 | 2.25 | 1.32 | 3.84 |
| 35-39 | 70.30 | 115 | 32.03 | 1.77 | 1.05 | 2.98 | - | - | - | - | 1.94 | 1.13 | 3.32 | 2.19 | 1.25 | 3.82 |
| 40+ | 13.75 | 33 | 9.19 | 2.73 | 1.26 | 5.91 | - | - | - | - | 3.83 | 1.67 | 8.80 | 4.15 | 1.76 | 9.78 |
| Country of origin | | | | | | | | | | | | | |
| Italy | 211.93 | 36 | 91.64 | 1.00 | - | - | 1.00 | - | - | - | - | 1.00 | - | - | - |
| Other | 14.61 | 25 | 6.96 | 1.15 | 0.58 | 2.25 | 1.18 | 0.59 | 2.36 | 1.24 | 0.61 | 2.51 | 1.21 | 0.57 | 2.53 |
| partner Country of origin | | | | | | | | | | | | | |
| Italy | 207.91 | 59 | 36 | 88.02 | 1.00 | - | - | 1.00 | - | - | - | - | 1.00 | - | - |
| Other | 10.44 | 22 | 6.13 | 1.44 | 0.67 | 3.11 | 1.37 | 0.63 | 2.97 | 1.57 | 0.71 | 3.45 | 1.51 | 0.67 | 3.40 |
| marital status | | | | | | | | | | | | | |
| married | 201.88 | 94 | 318 | 88.58 | 1.00 | - | - | 1.00 | - | - | - | - | 1.00 | - | - |
| single | 24.10 | 62 | 37 | 10.31 | 0.97 | 0.57 | 1.68 | 0.88 | 0.51 | 1.54 | 0.92 | 0.50 | 1.67 | 0.86 | 0.46 | 1.60 |
| women level of education (degree achieved) | | | | | | | | | | | | | |
| less than high school | 38.16 | 81 | 17.86 | 1.10 | 0.68 | 1.79 | 1.21 | 0.73 | 2.02 | 1.06 | 0.59 | 1.91 | 1.11 | 0.61 | 2.03 |
| high school | 110.48 | 67 | 15.46 | 0.94 | 0.65 | 1.36 | 1.00 | 0.68 | 1.46 | 0.89 | 0.59 | 1.34 | 0.92 | 0.60 | 1.41 |
| university | 78 | 34.51 | 125 | 34.82 | 1.00 | - | - | 1.00 | - | - | - | - | 1.00 | - | - |
| partner level of education (degree achieved) | | | | | | | | | | | | | |
| less than high school | 69.30 | 50 | 23.69 | 1.11 | 0.71 | 1.73 | 1.21 | 0.77 | 1.91 | 1.14 | 0.72 | 1.80 | 1.21 | 0.75 | 1.95 |
| high school | 88.38 | 94 | 15.46 | 1.40 | 0.92 | 2.11 | 1.57 | 1.02 | 2.39 | 1.48 | 0.96 | 2.27 | 1.51 | 0.97 | 2.35 |
| university | 64.28 | 32 | 16.96 | 1.00 | - | - | 1.00 | - | - | - | - | 1.00 | - | - |
| occupational status | | | | | | | | | | | | | |
| employed in maternity leave | 169.74 | 274 | 76.32 | 1.00 | - | - | 1.00 | - | - | - | - | 1.00 | - | - |
| employed | 20.85 | 23 | 6.41 | 0.71 | 0.38 | 1.33 | 0.70 | 0.37 | 1.33 | 0.77 | 0.40 | 1.49 | 0.79 | 0.40 | 1.55 |
| housewife | 18.79 | 26 | 7.24 | 0.89 | 0.47 | 1.67 | 0.96 | 0.50 | 1.83 | 0.96 | 0.49 | 1.85 | 1.04 | 0.52 | 2.06 |
| unemployed | 15.66 | 31 | 8.64 | 1.28 | 0.67 | 2.43 | 1.35 | 0.70 | 2.60 | 1.63 | 0.81 | 3.26 | 1.47 | 0.72 | 2.98 |
| partner occupational status | | | | | | | | | | | | | |
| employed | 209.92 | 48 | 336 | 93.59 | 1.00 | - | - | 1.00 | - | - | - | - | 1.00 | - | - |
| unemployed | 9.39 | 18 | 5.01 | 1.24 | 0.55 | 2.82 | 1.22 | 0.53 | 2.80 | 1.14 | 0.48 | 2.66 | 1.02 | 0.43 | 2.45 |
| house size (m²) | | | | | | | | | | | | | |
| >100 | 70.30 | 85 | 23.68 | 1.00 | - | - | 1.00 | - | - | - | - | 1.00 | - | - |
| <=100 | 155.68 | 58 | 31.21 | 1.44 | 0.99 | 2.08 | 1.56 | 1.06 | 2.28 | 1.52 | 1.03 | 2.24 | 1.51 | 1.02 | 2.25 |
| smoking | | | | | | | | | | | | | |
| never | 119.52 | 65 | 58.22 | 1.00 | - | - | 1.00 | - | - | - | - | 1.00 | - | - |
| smoker | 21.92 | 38 | 10.58 | 1.03 | 0.58 | 1.84 | 1.06 | 0.59 | 1.90 | 1.11 | 0.60 | 2.06 | 1.25 | 0.65 | 2.40 |
| ex smoker | 82.36 | 207 | 29 | 89.01 | 0.74 | 0.52 | 1.07 | 0.76 | 0.52 | 1.09 | 0.74 | 0.51 | 1.09 | 0.81 | 0.55 | 1.21 |

* Multivariate model adjusted for: age, partner education, house

| **Note** | | | | | | | | | | | | | |
| 1 | Multivariate model adjusted for: age, partner education, house, comorbidities |
| 2 | Reference category |
Table 4. Odds Ratios (OR), with 95% Confidence Interval (95%CI), of having at least one dispensing for folic acid and/or iron during pregnancy, by socio-demographic characteristics.

| Characteristic                        | dispensing for folic acid and/or iron during pregnancy | univariate | multivariate | multivariate |
|---------------------------------------|--------------------------------------------------------|------------|--------------|--------------|
|                                       | none (N= 413)                                          | at least one (N= 354) | OR   | 95%CI | OR   | 95%CI | OR   | 95%CI |
| age category (years)                  |                                                        |             |      |      |      |      |      |      |
| <25                                   |                                                        |             | 20   | 4.8  | 0.73 | 3.06 | 1.64 | 0.77 | 1.79 | 0.83 | 3.85 |
| 25-29                                 |                                                        |             | 64   | 15.5 | 1.00 | 0.99 | 1.00 | 0.99 | 1.00 | 0.99 | 1.00 |
| 30-34                                 |                                                        |             | 171  | 41.4 | 0.80 | 1.27 | 0.82 | 1.97 | 1.33 | 0.85 | 2.09 |
| 35-39                                 |                                                        |             | 129  | 31.2 | 0.67 | 0.67 | 0.99 | 0.69 | 0.75 | 0.71 | 1.86 |
| 40+                                   |                                                        |             | 29   | 7.0  | 0.72 | 2.58 | 1.57 | 0.81 | 1.70 | 0.86 | 3.34 |
| country of origin                     |                                                        |             | 384  | 93.0 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 | 0.90 |
| Italy                                 |                                                        |             | 24   | 5.8  | 3.5  | 0.99 | 1.77 | 1.03 | 3.03 | 1.64 | 0.94 | 2.86 | 1.57 | 0.88 | 2.80 |
| Other country of origin               |                                                        |             | 19   | 4.6  | 6.5  | 1.42 | 0.76 | 2.66 | 1.35 | 0.71 | 2.57 | 1.35 | 0.71 | 2.59 |
| marital status                        |                                                        |             | 367  | 88.9 | 316  | 89.3 | 1.00 | -    | -    | 1.00 | -    | -    | 1.00 | -    |
| married                               |                                                        |             | 41   | 9.9  | 10.2 | 1.02 | 0.64 | 1.63 | 0.95 | 0.56 | 1.59 | 0.89 | 0.52 | 1.51 |
| single                                |                                                        |             | 78   | 18.9 | 61   | 17.2 | 0.79 | 0.52 | 1.20 | 0.62 | 0.37 | 0.99 | 0.65 | 0.40 | 1.08 |
| women level of education (degree achieved) |                                                        |             | 202  | 48.9 | 162  | 45.8 | 0.81 | 0.59 | 1.12 | 0.75 | 0.53 | 1.07 | 0.80 | 0.56 | 1.15 |
| less than high school                 |                                                        |             | 132  | 32.0 | 130  | 36.7 | 1.00 | -    | -    | 1.00 | -    | -    | 1.00 | -    |
| high school                           |                                                        |             | 124  | 30.0 | 100  | 28.2 | 1.03 | 0.70 | 1.53 | 0.98 | 0.65 | 1.47 | 1.04 | 0.69 | 1.57 |
| university                             |                                                        |             | 181  | 43.8 | 167  | 47.2 | 1.18 | 0.82 | 1.69 | 1.14 | 0.78 | 1.65 | 1.17 | 0.80 | 1.71 |
| occupational status                   |                                                        |             | 101  | 24.5 | 79   | 22.3 | 1.00 | -    | -    | 1.00 | -    | -    | 1.00 | -    |
| employed in maternity leave           |                                                        |             | 308  | 74.6 | 260  | 73.4 | 1.00 | -    | -    | 1.00 | -    | -    | 1.00 | -    |
| employed                              |                                                        |             | 31   | 7.5  | 26   | 7.3  | 0.99 | 0.57 | 1.72 | 1.01 | 0.57 | 1.78 | 0.98 | 0.55 | 1.75 |
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Discussion

In this cohort 70% of women was dispensed at least one medication during pregnancy, in the range of a recent systematic review [1]. Iron and folic acid were the most common agents. Women younger than 25 and above 30 years were more likely to have at least one prescription medication dispensed during pregnancy. This result is in line with prior studies showing higher use of medication in the oldest and youngest age categories compared to the intermediate age [2,6,7,22,23]. In FVG the mean maternal age at delivery in 2008 was 31.2 years [24], suggesting that health care personnel should pose even more attention to supervising medication use, as many of their patients would use at least one medication.

We found that women with education lower education were less likely to use folic acid and iron but not other medications, compared with women with university degree. Prior studies reported inconsistent results. In two Danish studies women in the lowest educational category were 30% and 40% more likely of filling prescriptions for antibiotics, respectively, than those with women with university degree. Prior studies reported inconsistent results. In two Danish studies women in the lowest educational category were 30% and 40% more likely of filling prescriptions for antibiotics, respectively, than those with women with university degree. Prior studies reported inconsistent results. In two Danish studies women in the lowest educational category were 30% and 40% more likely of filling prescriptions for antibiotics, respectively, than those with women with university degree. Prior studies reported inconsistent results. In two Danish studies women in the lowest educational category were 30% and 40% more likely of filling prescriptions for antibiotics, respectively, than those with women with university degree. Prior studies reported inconsistent results. In two Danish studies women in the lowest educational category were 30% and 40% more likely of filling prescriptions for antibiotics, respectively, than those with women with university degree. Prior studies reported inconsistent results. In two Danish studies women in the lowest educational category were 30% and 40% more likely of filling prescriptions for antibiotics, respectively, than those with women with university degree. Prior studies reported inconsistent results. In two Danish studies women in the lowest educational category were 30% and 40% more likely of filling prescriptions for antibiotics, respectively, than those with women with university degree. Prior studies reported inconsistent results. In two Danish studies women in the lowest educational category were 30% and 40% more likely of filling prescriptions for antibiotics, respectively, than those with women with university degree. Prior studies reported inconsistent results. In two Danish studies women in the lowest educational category were 30% and 40% more likely of filling prescriptions for antibiotics, respectively, than those with

and highest (1.20; 95%CI 0.25-5.81) category were associated with increased OR only in women not reporting comorbidities, however several strata included a small number of subjects (Table 5).

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In our cohort, immigrant women and those with immigrant partner were more likely to use medications as well as iron and folic acid than those born in Italy and with Italian native partners, respectively. Conversely, in prior studies, immigrant women were less likely to use medications than not immigrant women [2,8]. In Belgium, maternal self-reported medication use was positively associated with Western origin, being born in Belgium, and employment status
Table 5. Odds Ratio (OR), with 95% Confidence Interval (95%CI), of redeeming at least one prescription of any medication during pregnancy according to comorbidities, by socio-demographic characteristics.

| comorbidities during pregnancy | at least one | none |
|-------------------------------|-------------|------|
| prescription redemption       | univariate  | age adjusted | multivariate¹ | prescription redemption | univariate | age adjusted | multivariate¹ |
| none                          | at least one | (N= 133) | 1.36 | 0.53-3.46 | - - | - - | 1.61 | 0.57-4.53 | 2 (2.25) | 10 (6.62) | 6.36 | 1.15-35.23 | - - | 12.22 | 1.31-13.89 |
| (N= 89)                       | at least one | (N=151) | 6.36 | 1.15-35.23 | - - | - - | 1.61 | 0.57-4.53 | 2 (2.25) | 10 (6.62) | 6.36 | 1.15-35.23 | - - | 12.22 | 1.31-13.89 |
| age category (years)          |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| <25                           |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| -                              |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| 25-29¹                        |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| 30-34                         |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| 35-39                         |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| 40+                           |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| country of origin             |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| Italy¹                        |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| Other                         |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| marital status                |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| married¹                      |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| single                        |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| women level of education      |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| (degree achieved)             |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| less than high school         |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| high school                   |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| university²                   |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| partner level of education    |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| (degree achieved)             |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| less than high school         |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| high school                   |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| occupational status           |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| employed²                     |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |
| unemployed                    |             |             |      |            |     |     |      |            |     |     |      |            |     |     |      |            |     |     |

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| Variable                        | Measurement | Mean   | Median | 25th Percentile | 75th Percentile | P-value | 95% CI  |
|--------------------------------|-------------|--------|--------|-----------------|-----------------|---------|---------|
| partner occupational status    |             |        |        |                 |                 |         |         |
| employed                       |             | 121    | 90.98  | 1.00            | -               |         |         |
| unemployed                     |             | 348    | 92.06  | 1.00            | -               |         |         |
| house size (m²)                |             | 20     | 5.29   | 1.16            | 0.45-2.95       | 0.07    | 0.35-7.84 |
| >100                            |             | 6      | 4.51   | 1.00            | -               |         |         |
| <=100                           |             | 100    | 4.82   | 1.00            | -               |         |         |
| smoking                         |             |        |        |                 |                 |         |         |
| never                           |             | 77     | 57.89  | 1.00            | -               |         |         |
| <4                              |             | 86     | 64.66  | 1.00            | -               |         |         |
| 5+                              |             | 3      | 2.26   | 1.00            | -               |         |         |
| alcohol consumption (drinks/week)|         | 44     | 33.08  | 1.00            | -               |         |         |
| BMI (kg/m²)                     |             |        |        |                 |                 |         |         |
| <18.50 under weight             |             | 10     | 7.52   | 1.05            | 0.49-2.23       | 0.07    | 1.02-16.36 |
| 18.50-24.99 normal              |             | 269    | 24.33  | 1.00            | -               |         |         |
| 25+30 overweight               |             | 56     | 14.29  | 1.06            | 0.60-1.88       | 0.07    | 0.24-1.19 |
| >=30 obese                      |             | 26     | 5.26   | 1.06            | 0.52-2.96       | 0.07    | 0.25-5.81 |
| prior pregnancies               |             |        |        |                 |                 |         |         |
| 1-2                             |             | 16     | 50.38  | 0.87            | 0.57-1.31       | 0.07    | 0.51-1.66 |
| 3 or more                       |             | 9      | 6.77   | 1.06            | 0.47-2.38       | 0.07    | 0.42-4.02 |
| prenatal care visits (number)   |             |        |        |                 |                 |         |         |
| <7                              |             | 12     | 9.02   | 1.00            | -               |         |         |
| 7                               |             | 23     | 17.29  | 0.66            | 0.30-1.48       | 0.07    | 0.72-4.64 |
| 8                               |             | 39     | 29.32  | 0.50            | 0.24-1.16       | 0.07    | 0.63-4.64 |
| 9 or more                       |             | 49     | 36.84  | 1.00            | 0.49-2.04       | 0.07    | 0.53-2.48 |
| prenatal ultrasound imaging (number) |         | 33     | 24.81  | 1.00            | -               |         |         |
| <4                              |             | 66     | 17.46  | 1.00            | -               |         |         |
| 4                               |             | 21     | 15.79  | 1.74            | 0.92-3.30       | 0.07    | 0.39-2.22 |
| 5-7                             |             | 33     | 24.81  | 1.67            | 0.94-2.95       | 0.07    | 0.39-2.22 |
| 8 or more                       |             | 40     | 30.08  | 1.34            | 0.77-2.33       | 0.07    | 0.39-2.22 |

1 Multivariate model adjusted for: age, partner education, house
2 Reference category
medication consumption. It has been estimated that 6% of dispensed OTC medications use [32].

Prior parity was inversely associated with prescriptions of any medication, and of antibiotics. In some prior studies, nulliparity was associated with a 40% increased likelihood of reporting medications with potential for fetal harm, but not any medication [11] and with a 66% increased likelihood of reporting OTCs [32]. Conversely, in another study nulliparous women were 40% less likely of reporting medication use than parous women [7]. Having had previous children has been associated with an increased likelihood of reporting the use of medications for acute/short-term illnesses and of OTCs, but not of medications for chronic or long-term conditions [2].

We collected information on education and occupational status as measures of socio-economic status, but not on household income. However, education as a measure of socioeconomic status captures both the dimension of knowledge and earning capacity, through professional position.

Strengths

This study takes into account the health status of the women, a strong determinant of medication use during pregnancy, through adjustment for comorbidities.

Moreover, the study evaluates also the effect of characteristics of the partner, such as educational level, occupational and immigration status.

The prescription database covers the entire resident population, without any exclusion according to occupational or socioeconomic status. All women in the cohort were linked to dispensing records, without omissions of population subgroups (e.g. unemployed or immigrant women). The potential for information bias is thus reduced.

Conclusion

Adjusting for maternal age and comorbidities, sociodemographic characteristics remained associated with the use of prescription medication during pregnancy. Use of any medication was associated with lower education, immigrant status and unemployment. However, less educated women were less likely to use folic acid and iron. Care providers should thus target women with low educational level in promoting folic and iron supplementation during pregnancy. Detecting differences in medication use during pregnancy according to sociodemographic and lifestyle variables is useful for planning interventions promoting safe medication use during pregnancy and to tailor such interventions to the specific characteristics of women. Future studies should evaluate if the inappropriate use of medications during pregnancy has sociodemographic differential.

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