

Exposure of Pregnant Women to Chemicals and Cosmetic Products*

Abstract

Background: It is known that exposure to chemicals and cosmetic products causes harmful effects on health. Knowing the exposure of pregnant women to chemicals and cosmetic products is important in planning prenatal care.

Aim: This study is a descriptive study conducted to determine the exposure of pregnant women to chemicals and cosmetic products.

Methods: The sample of the study consisted of 315 pregnant women. The data were collected by the researchers using a data collection form and face-to-face interview method. The study was conducted between September 2016 and November 2016, in Kayseri Training and Research Hospital, Gynecology and Obstetrics Clinic. Descriptive statistics (number, percentage, and mean) were used in the analysis of the data.

Results: The mean age of the pregnant women was 26.10 ± 5.6 years, 73.7% of them lived in the city center, 42.9% of them were middle school graduates, and 88.3% of them did not work. It was determined that 67.6% of pregnant women used deodorant/perfume during pregnancy, 32.1% used lipstick, and 7.9% used hair dye. In addition, it was revealed that 91.7% of the pregnant women were exposed to bleach, 44.1% to surface cleaner, 34.6% to oil and 21.6% to descaler, and 10.5% to spirit of salt.

Conclusion: As a result, exposure rates of pregnant women to chemicals and cosmetic products were high. Women should be educated about the harms of chemicals and cosmetics both in the preconception period and during pregnancy.

Keywords: Pregnancy, exposure, chemicals, cosmetics

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Introduction

Household cleaning products are used worldwide to maintain the functionality, appearance, and appropriate hygienic conditions of our homes.¹ Today, babies, children, and women spend a large part of their life in the indoor environment and are exposed to chemicals.² For this reason, household cleaning products affect most babies, children, and pregnant women and their fetus.¹ Chemicals exposed during pregnancy may cause abortion, stillbirth, congenital anomaly, low birth weight, and endocrine glands disorders.³⁻⁵ Toxic substances to which mothers are exposed to can pass to the fetus through the placenta by simple diffusion, and many chemicals have teratogenic effects. It is thought that 1%-5% of congenital malformations are caused by teratogenic substances such as drugs and chemicals.⁶ One of the chemicals, pregnant women are exposed to at home, is cigarette smoke. Exposure to smoking or cigarette smoke during pregnancy affects fertility, fetal development, every stage of pregnancy, birth, and then, the health and development of the baby.⁷

Exposure to chemicals occurs not only by using household cleaning products but also by using cosmetic products. Cosmetics enter our body through absorption, swallowing, or inhalation.⁸ Any chemical applied on the skin or mucosal tissue is absorbed and can pass into the blood. These chemicals can pass through the placental barrier and reach the fetus.⁹ Cosmetic chemicals, which have entered daily life, are held responsible for the etiology of pathologies such as cancer, infertility, and birth defects.¹⁰ Chemicals contained in cosmetics can have teratogenic effect on fetus.¹¹ Maternal blood lead levels of approximately 10 g/dL have been linked to increased risks of pregnancy hypertension and spontaneous abortion and reduced offspring neurobehavioral development.¹² Lead and retinoid in cosmetic products can lead to congenital defects.^{6,9} However, triclosan in the structure of many cosmetics and toothpastes was associated with decreased

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fertility.¹³ Parabens and phthalates are potential endocrine disrupters commonly used in personal care products, and the developing fetus may be sensitive to these chemicals.¹⁴ High exposure to mono-ethyl phthalate was associated with excessive weight gain during pregnancy and impaired glucose tolerance.¹⁵

Nurses play an important role in protecting and improving the health of mother and baby and preventing diseases in pre-pregnancy, pregnancy, childbirth, and postnatal period. The identification of behaviors that may cause diseases, disabilities, or even death during pregnancy will contribute to the protection of the health of the mother, the child, and the society. Preventing female exposure to certain chemicals during pregnancy is important to protect the health of both the woman and the baby.

Although the harmful effects of exposure to chemicals and cosmetic products are known, studies on the exposure of pregnant women to chemicals and cosmetic products are limited. Therefore, this study was conducted to determine the exposure rate of pregnant women to chemicals and cosmetic products.

Study Questions

1. What is the rate and frequency of cosmetic use by pregnant women?
2. What is the rate of reducing the use of cosmetics by pregnant women during their pregnancy?
3. What is the rate and frequency of exposure of pregnant women to chemicals?
4. What are the rates of precautions taken by pregnant women while exposed to chemicals?

Materials and Methods

Research Design

This research is a descriptive study.

Participants

The sample of the study consisted of 1756 pregnant women. The sample size was calculated as 315 by using the method of sampling from known population. The data were obtained from the pregnant women who applied to the hospital's obstetrics clinic for prenatal care check-ups, who were in the last trimester of pregnancy, who had no verbal communication problems, and who volunteered to participate in the study.

Data Collection Tools

To determine the exposure rate of pregnant women to chemicals and cosmetic products, a data collection form was developed by the researchers by scanning the literature.¹⁻¹⁵ This form consisted of 2 parts. In the first part, there were questions about the socio-demographic characteristics (age, place of residence, education, employment, income, education and job of the husband, chemical exposure due to the husband's job) and obstetric characteristics (number of pregnancies and birth, month of pregnancy, miscarriage, stillbirth, and preterm birth, having a disabled child, smoking, alcohol, drug, and herbal tea use during pregnancy, and receiving prenatal care). The second part consisted of 34 questions to determine exposure to chemicals and cosmetic products during pregnancy.

During the development of the interview form, after taking expert opinion, the form was applied to 20 pregnant women to evaluate

whether the questions in the form were comprehensible. These pregnant women were from outside the sample of the study.

Data Collection

The study was conducted between September 2016 and November 2016, in Kayseri Training and Research Hospital, Gynecology and Obstetrics Clinic. The study was based on volunteerism. The data were collected by the researchers using a semi-structured form and face-to-face interview method. Each interview lasted approximately 10 minutes.

Data Analysis

The data of the study were analyzed by using Statistical Package for the Social Sciences 20.0 package program. Descriptive statistics (number, percentage, and average) were used for the evaluation of the data.

Ethical Considerations

Written permission (No: 27268541/044) was obtained from the Training and Research Hospital to conduct the study. In addition, approval (84902927/2016.06.03) was obtained from the Ethics Committee of Nevşehir Hacı Bektaş Veli University to conduct the study. Also, the aim of the study was explained to the pregnant women and their consent was obtained.

Results

The mean age of the pregnant women was 26.10 ± 5.6 years, 73.7 % of them lived in the city center, 42.9% of them were middle school graduates, and 88.3% of them did not work. In addition, of the pregnant women, 60% had multipara, 7.3% had premature birth, 26% had abortion, and 2.9% had stillbirth history. It was found that 20.3% of pregnant women used to smoke before pregnancy and 4.4% of them continued to smoke during pregnancy and 64.1% of them were exposed to cigarette smoke during pregnancy.

Of the pregnant women, 67.6% used deodorant/perfume, 61% used eyeliner, 53% used mascara, 32.1% used lipstick, and 7.9% used hair dye during pregnancy. In addition, it was determined that 38.4% of pregnant women used deodorant/perfume, 55.6% used teeth whitener, 27% used eyeliner, 23.2% used mascara, and 12.4% used lipstick daily (Table 1). 40% of the pregnant women who use anti-wrinkle cream, 24% of hair dye users, and 18.2% of hair spray users stated that they limit the use of these products. In this study, deodorant/perfume, eyeliner, shower gel, mascara, sun protector factor, nail polish, and lipstick use rates were very high during pregnancy (respectively, 95.8%, 95.8%, 94.7%, 94 %, 93.1%, 90.6%, and 90.1%) (Table 2). Additionally, it was determined that 98.4% of the pregnant women used washing liquid, 91.7% used bleach, 34.9% used oil solvent, 21.6% used descaling, and 10.5% used spirit of salt (Table 3).

It was determined that 91.7% of the pregnant women used washing liquid and 36.8% used bleach daily. In addition, the percentages of pregnant women who use oil solvent, descaling, spirit of salt, and naphthalene once a month were respectively 10.2%, 6.3%, 5.7%, and 4.1% (Table 4). 27.3% of the pregnant women using spirit of salt stated that they used gloves when using it. It was found that more than 95% of the pregnant women who used bleach, washing liquid, glass and surface cleaner, and fabric softener did not use gloves during the use of these products. It was seen that almost all pregnant women did not use masks when using chemicals. The percentages of pregnant women who restricted the use of spirit of salt, naphthalene, bleach,

Table 1. The Rates and Frequencies of Cosmetic Use of Pregnant Women

Cosmetics	Using Status	Cosmetic Use/Frequency (%)				
		Daily	Once a Week	2-3 Per Week	2-3 Per Month	Once in a Month
Teeth whitener	68.9	55.6	5.1	6.3	1.6	0.3
Deodorant/perfume	67.6	38.4	5.4	16.8	4.1	2.9
Eyeliners	61.0	27.0	6.7	21.6	3.2	2.5
Mascara	53.0	23.2	5.1	18.1	2.9	3.8
Lipstick	32.1	0.0	0.3	0.6	0.0	7.0
Shower gel	29.8	7.0	2.5	20.0	0.3	0.0
Foundation cream	21.6	2.5	3.8	8.9	1.9	4.4
Antiperspirant	18.1	11.4	1.6	2.5	2.2	0.3
Eye shadow	15.9	2.2	3.5	6.3	1.9	1.9
Nail polish	10.2	1.0	1.9	4.1	2.5	0.6
Nail polish remover	9.8	0.0	1.9	4.8	2.5	0.6
Sun protector factor	9.2	5.1	1.3	1.6	0.6	0.6
Hair dye	7.9	12.4	4.8	10.2	2.5	2.2
Hair Spray	7.0	2.2	1.6	1.9	0.6	0.6
Under eye concealer	5.7	1.6	1.0	2.2	0.6	0.3
Anti-wrinkle cream	1.6	0.3	0.3	0.6	0.3	0.0

and fat solvent during pregnancy were respectively 27.3%, 13.0%, 12.5%, and 11.8% (Table 5).

Discussion

Chemicals such as phthalate, lead, triclosan, and paraben in cosmetics have negative effects on reproduction and the fetus. In this study, it was determined that more than half of the pregnant women used deodorant/perfume, one-third of them used lipstick, and approximately one-tenth of them used nail polish and hair dye (Table 1). In another study, it was reported that 10.3% of the women continued to use perfume, 10.3% used nail polish, and 7.4 % used hair dye during pregnancy.¹¹ In a study conducted in Turkey, the most used products during pregnancy were determined as toothpaste, shampoo, and general hygiene products such as soap, hand cream, wet wipes, shower gel, conditioner, and moisturizer.¹⁶ Studies show that those who use cosmetics and personal care products have high exposure to chemicals.^{14,15,17-22} Considering the rate of cosmetic use by women in our study, this result can be interpreted that they are exposed to the harmful effects of cosmetics during pregnancy.

Pesticides are frequently used in homes as well as in agricultural areas. Exposure to pesticides in women during pregnancy causes neurodevelopmental disorders in early childhood^{24,25} and decreased reproductive function in men and hypospadias.²⁶ In addition, exposure to pesticides during pregnancy may lead to premature birth, miscarriage, stillbirth, and congenital anomalies.^{27,28} In this study, 12.1% of pregnant women stated to be exposed to pesticides (Table 3). In the studies, the rate of exposure of pregnant women to pesticides at home varies between 28% and 46.4%.^{24,29,30} The differences in exposure to pesticides in studies may be due to regional differences.

Chemicals affect male and female reproductive health and fetal health adversely. Thus, chemicals cause abortions, low birth weight, stillbirth, and congenital anomalies.³¹ In a study conducted in China, exposure to chemicals before/during pregnancy was associated with antepartum fetal death and early neonatal death, birth defects, preterm labor, and abortion.³² In the current study, it was determined that most of the pregnant women were exposed to bleach and other chemicals (Table 3). In the study conducted by Casas et al.³³ the most used cleaning products were glass cleaners (77%), bleach (74%), furniture polishes (42%), and ammonia (25%). In the present study, the condition of pregnant women to restrict the use of bleach, surface cleaner, degreaser, descaler, spirit of salt, and naphthalene is very limited (Table 5). In addition, the percentage of using masks when using bleach, degreaser, descaler, and spirit of salt is quite low (Table 5). In a study conducted, certain polychlorinated biphenyls, organochlorinated pesticides, phenols, phthalates, polycyclic aromatic hydrocarbons, and perchlorate were detected in 99%-100 % of pregnant women.³⁴ In our study, the rate of chemical exposure among pregnant women was very high. However, it was determined that pregnant women were not able to take necessary precautions during exposure. Naphthalene is one of the polycyclic aromatic hydrocarbon compounds.³⁵ Exposure to polycyclic aromatic hydrocarbons among pregnant women may contribute to adverse birth outcomes such as preterm birth.³⁶ In a study conducted by Boynukalin and Baykal,³⁷ methemoglobinemia and hemolytic anemia were detected in the mother and her baby by inhalation of naphthalene during pregnancy. Naphthalene exposures for most non-occupationally exposed individuals occur primarily indoors at home. Residential internal resources include pest control products (mothballs, etc.), incomplete combustion products

Table 2. The State of Reducing the Use of Cosmetics by Pregnant Women During Their Pregnancy

Cosmetics	Reducing Cosmetic Use During Pregnancies			
	Yes		No	
	n	%	n	%
Hair spray	4	18.2	18	81.8
Nail polish	3	9.4	29	90.6
Nail polish remover	4	12.9	27	87.1
Foundation cream	7	10.3	61	89.7
Eye shadow	6	12.0	44	88.0
Mascara	10	6.0	157	94.0
Eyeliners	8	4.2	184	95.8
Under eye concealer	2	11.1	16	88.9
Deo/perfume	9	4.2	204	95.8
Antiperspirant	6	10.5	51	89.5
Hair dye	6	24.0	19	76.0
Lipstick	10	9.9	91	90.1
Teeth whitener	9	4.1	208	95.9
Anti-wrinkle cream	2	40.0	3	60.0
Sun protector factor	2	6.9	27	93.1
Shower gel	5	5.3	89	94.7

such as cigarette smoke, wood-burning stoves, and construction products.³⁸ In our study, the rate of exposure to naphthalene was found to be 7.3%. In a study conducted by Sahni et al.³⁹ indoor and personal

Table 3. The Exposure Rates of Pregnant Women to Chemicals

Chemicals	Exposure to Chemicals	
	n	%
Washing liquid	310	98.4
Bleach	289	91.7
Washing powder	289	91.7
Fabric softener	234	74.3
Surface cleaner	139	44.1
Oil solvent	110	34.9
Room odor	103	32.7
Glass cleaner	100	31.7
Descaling	68	21.6
Wall paint	44	14.0
Pesticide	38	12.1
Spirit of Salt	33	10.5
Naphthalene	23	7.3

Table 4. Frequency of Exposure of Pregnant Women to Chemical Products

Chemicals	Frequency of Exposure (%)				
	Daily	Once a Week	2-3 Per Week	2-3 Per Month	Once in a Month
Washing liquid	91.7	2.5	3.5	0.3	0.3
Bleach	36.8	16.8	27.3	7.0	3.8
Room odor	24.8	1.3	3.8	1.6	1.3
Washing powder	19.0	37.1	32.4	1.3	1.9
Fabric softener	13.7	30.8	27.0	2.2	0.6
Surface cleaner	9.2	10.5	11.1	8.9	4.4
Oil solvent	8.3	5.1	6.7	4.8	10.2
Glass cleaner	5.4	5.4	8.9	5.7	6.3
Descaling	3.8	5.1	2.9	3.5	6.3
Naphthalene	3.0	0.3	0.0	1.6	4.1
Spirit of salt	0.6	1.3	0.6	2.2	5.7

air mothball concentrations were significantly higher in postpartum period than pregnancy period.³⁹ Pregnant women may have inadequate knowledge of the harmful effects of chemicals. They should be informed about the damages of the use of chemicals in pregnancy and take necessary precautions during the use of chemicals.

Cigarette smoke is one of the chemicals that pregnant women are exposed to. Active or passive smoking during pregnancy seriously

Table 5. Precautions Taken by Pregnant Women During Exposure to Chemicals

Chemicals	Reducing Exposure		Using Gloves		Using a Mask	
	n	%	n	%	n	%
Bleach (n=289)*	36	12.5	13	4.5	9	3.1
Oil solvent (n=110)*	13	11.8	6	5.5	2	1.8
Washing powder (n=289)*	11	3.8	7	2.4	4	1.4
Washing liquid (n=310)*	10	3.2	8	2.6	3	1.0
Spirit of salt (n=33)*	9	27.3	9	27.3	5	15.2
Fabric softener (n=234)*	9	3.8	3	1.3	2	0.9
Room odor (n=103)*	7	6.8	2	1.9	1	1.0
Descaling (n=68)*	6	8.8	5	7.4	2	2.9
Surface cleaner (n=139)*	6	4.3	5	3.6	1	0.7
Glass cleaner (n=100)*	5	5.0	4	4.0	2	2.0
Naphthalene (n=23)*	3	13.0	2	8.7	0	0.0

* Number of exposed pregnant women.

damages the health of the mother and the baby. The risk of low birth weight, sudden infant death syndrome, stillbirth, and behavioral disorders increases in babies of mothers who smoke during pregnancy.⁴⁰ In our study, it was determined that 20.3% of women smoked before pregnancy, 4.4% continued to smoke during pregnancy, and 64.1% were exposed to cigarette smoke during pregnancy. In the study conducted by Tarhan and Yılmaz,⁴¹ it was determined that 26.6% of women smoked before pregnancy, 11.9% continued smoking during pregnancy, and 63.9% were exposed to cigarette smoke during pregnancy. In a study conducted by Marakoğlu and Sezer,⁴² it was determined that 9% of pregnant women smoked during their pregnancy and 87.5% of them were exposed to cigarette smoke at home. In a study conducted by Durualp et al.⁴³ it was determined that 23.9% of pregnant women smoked and 56.2% were exposed to cigarette smoke. In our study and other studies, especially, the rate of passive smoking was found to be high. Even if pregnant do not smoke themselves, they are exposed to the harmful effects of smoking in the home environment. This result is important in terms of showing the importance of involving family members in education in planning the training to be given to pregnant women.

Conclusion

As a result, it was determined that the rate of exposure of pregnant women to chemicals and cosmetic products was high. In addition, it was determined that the rate of reducing the use of these products during pregnancy and taking precautions while using these products was low. The percentages of pregnant women who restricted the use of spirit of salt, naphthalene, bleach, and fat solvent during pregnancy were less than one-third of the pregnant women.

Training on the harmful effects of chemicals and cosmetics in pregnancy should be added to the prenatal care guide. These training should be given to women who are planning pregnancy during the periconceptional period. Studies should be planned to determine the knowledge of pregnant women about the effects of chemicals and cosmetics on the health of the mother and the baby. Studies should be carried out to determine pesticide exposure during women's pregnancy in the regions where agricultural labor is done.

Ethics Committee Approval: Ethics committee approval was received for this study from Ethics Committee of Nevşehir Hacı Bektaş Veli University (June 8, 2016, 84902927).

Informed Consent: Verbal informed consent was obtained from the pregnant women participating in the study.

Peer-review: Externally peer-reviewed.

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