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Awareness of use dermatological agents/cosmetics in preconception and early pregnancy that can cause fetal abnormalities in Hail Region, Saudi Arabia

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ABSTRACT

Objective: The objective of this study is to evaluate awareness of use dermatological agents/cosmetics during preconception period and pregnancy that can affect the fetus. *Material/methods:* This descriptive cross-sectional study was conducted in Hail region of Saudi Arabia by Hail University. Study was completed during 3 months duration and 401 women of reproductive age included. A questionnaire containing information regarding their knowledge about harmful dermatological agents/cosmetics, period of maximum affect and resulting fetal problems were assessed. Chi-square t-test was used to determine the significance of results taking p-value <0.05 as significant. *Results:* In these study n=401 women of reproductive age participated. The majority of (61.8%) of the participants were 21-25 years old. Many of them were well educated, 349 (87%) held bachelor degree. Singles formed (66.8%) and 29.7% were married. A large majority 91.8% expressed their view that some dermatological agents/cosmetics are not safe to use in preconception or during pregnancy (p<0.05). Most of the women expressed their concerns for acne creams, skin lightening agents and hair products,52.9% told that they check ingredients before purchasing (p>0.05). While 5.7% of participants' relatives or people around already had some fetal abnormalities because of the mother's use of harmful agents during pregnancy. *Conclusion:* Majority of participants believe that harmful dermatological agents can affect only during first 3 months of pregnancy and can cause neurodevelopment delay in the fetus but are not associated with genital, thyroid or mental illness nor they can cause abortions, stillbirths, preterm labors.

Keywords: Dermatological agents, cosmetics, pregnancy, preconception, fetal abnormalities.

1. INTRODUCTION

Pregnancy is one of the most special moments for every woman, but some physiologic changes occur in her body, like skin. It is known that skin treatment is important to control some conditions that can begin or get worse during pregnancy. However, dermatologists must educate their patients on what can or cannot be prescribed during this period (Abulafia & Vieira, 2017). Dermatologists need to know medication safety in pregnancy to be able prescribe drugs to pregnant women during treatment for dermatologic conditions (Kelly & Matthew, 2013). The European Union Cosmetics Directive translation cosmetic products "substances that placed and contact with the external parts of the human body (lips, hair system, nails, external genital organs and epidermis) to protect, cleaning them, good body odors and changing their appearance (European Union, 2009). Also, Cosmetic products contain many chemical substances that may have the potential to be harmful. Cosmetics contain various chemical substances such as phthalates and other plasticizers, bisphenol A, parabens, benzophenones (ultraviolet filters), polycyclic musk, triclosan (antimicrobials), dioxane, organic solvents, pigments, formaldehyde, and heavy metals that serve as active ingredients, solvents, preservatives and additives to improve their efficacy and increase the duration of their effect (Juhász & Marmur, 2014; Bocca et al., 2014).

Women use cosmetics in pregnancy and the harm of these products not known (Cécile Marie et al., 2016). Dermatologists sometimes deal with female patients that may become pregnant during the treatment of their dermatological conditions. Hence, dermatologists must be familiar with the potential effects of common medications on the fetus (Yun Peiet al., 2019).

Studies are deficient in Hail, Saudi Arabia in the subject of awareness of the use of dermatological agents/cosmetics in preconception and early pregnancy, this study will evaluate the awareness of the use and how they can cause fetal abnormalities in Hail, Saudi Arabia.

2. METHODOLOGY

Study design and study sample

A descriptive cross-sectional community-based study was carried out during 2020 (from May 2020 – to July 2020) to determine knowledge of women of reproductive age regarding harmful dermatological agents /cosmetics, period of maximum affect and resulting fetal problems. The study involved the distribution of (401) questionnaires to randomly select women of reproductive age from different groups in the general population of Hail city, located in north-western of Kingdom of Saudi Arabia.

Data collection

A self-administered close-ended questionnaire was design. It consisted of 9 questions which were guided by study objectives. The questionnaire included 5 sections: The first section comprises sociodemographic data such as age, marital status, education level and the second section for the knowledge about the use of dermatological agents/cosmetics during preconception period or pregnancy. The third section was for assessment of the women's knowledge regarding fetal abnormalities causes during preconception or pregnancy. The fourth section was made to assess the knowledge of women regarding the period of using dermatological agents/cosmetics during pregnancy which may cause fetal abnormalities. The fifth section was about the fetal abnormalities the participants may think are caused by the use of dermatological agents/cosmetics in preconception period or during pregnancy.

Questionnaires were designed in Arabic language. These questionnaires were sent out to relatives, friends, university students, employee, and distributed through the community of Hail city, Saudi Arabia. The objectives of the study were explained, and a verbal consent was obtained from each of the participants.

Data analysis

Data entry and analyzed using Microsoft Excel and the Software Statistical Package for the Social Science (SPSS) version 23. Descriptive statistics including frequencies and percentages were used to describe the items and the study variables. Chi square tests were conducted to test the differences of the nominal data. The p values at 0.05 were considered statistically significant.

3. RESULTS

Demographic information

401 people participated in the current study; the age of 21-25 years old represents the majority of 61.8% of the participants. 349 hold bachelor degree (87%). Most of the respondents were singles (66.8%) and 29.7% were married (See Table 1 and Figure 1).

Table 1 Demographic information (n=401).

Variable		n	%	*p*
Age	16-20	33	8.2%	0.000**
	21-25	248	61.8%	
	26-30	44	11%	
	31-35	21	5.2%	
	More than 35	55	13.7%	
Education level	Intermediate	9	2.2%	0.000**
	Secondary	33	8.2%	
	Bachelor	349	87%	
	Master	5	1.2%	
	Other	5	1.2%	
Marital status	Single	268	66.8%	0.000**
	Married	119	29.7%	
	Other	14	3.5%	
****p is significant at 0.05**				

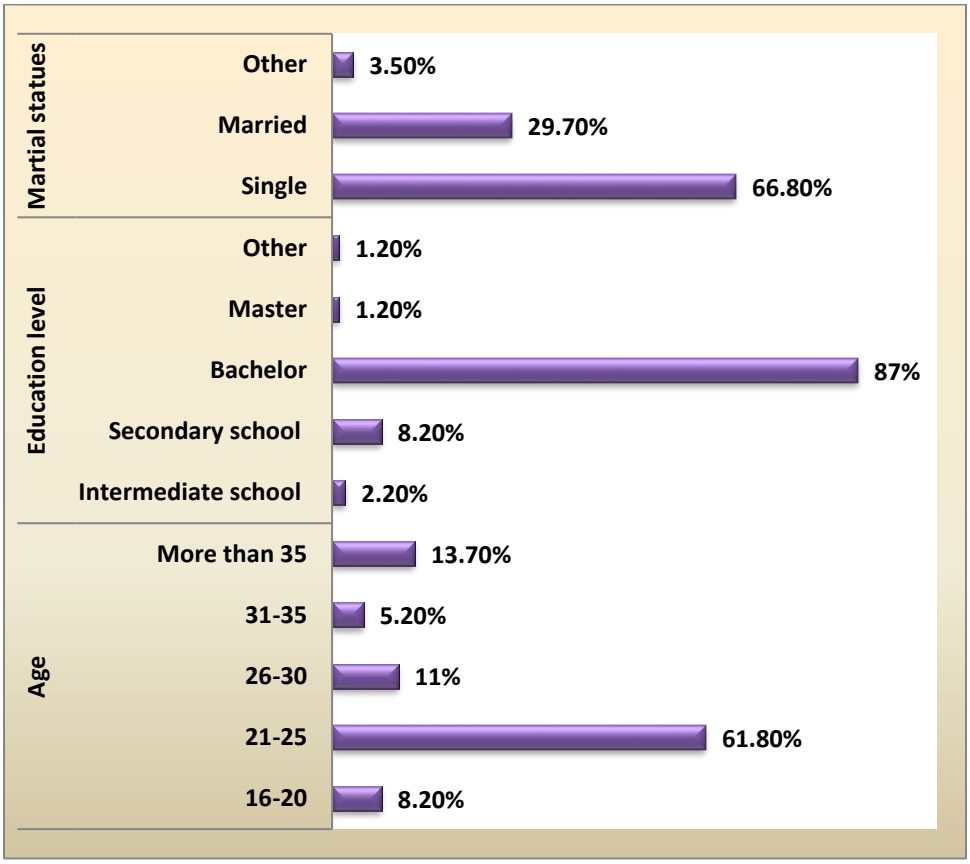

Figure 1 Demographic information (n=401)

Awareness about use dermatological agents/cosmetics in preconception or during pregnancy

As shown in Table (2) 91.8% of the participants had known that that some dermatological agents/cosmetics are not safe to use in preconception or during pregnancy ($p<0.05$), while 52.9% agreed that check ingredients before purchasing dermatological agents/cosmetics were a habits ($p>0.05$), only 5.7% of participants' relative or people have fetal abnormalities as a result of the mother's use of dermatological agents or cosmetics.

Table 2 Awareness about use of dermatological agents/cosmetics in preconception or during pregnancy

Factor		n	%	p
The habit to check ingredients before purchasing dermatological cosmetics/agents	No	212	52.9%	0.251
	Yes	189	47.1%	
cosmetics are not safe /knowing that some dermatological agents to use in preconception or during pregnancy	No	33	8.2%	0.000**
	Yes	368	91.8%	
Relative or people have fetal abnormalities as a result of the mother's use of dermatological agents or cosmetics	No	378	94.3%	0.000*
	Yes	23	5.7%	
**p is significant at 0.05				

The knowledge of fetal abnormalities causes in preconception or during pregnancy

Table (3) presents the knowledge of fetal abnormalities causes in preconception or during pregnancy, the participants agreed that the most cause is the hair products such as: hair dyes - hairspray - hair removal creams with 75.8% ($p<0.05$), then Skin lightening creams with 55.9% ($p<0.05$), while Acne creams had 50.9% of agreement ($p>0.05$), on the other hand, anti-aging and wrinkles creams with only 26.2% of agreement ($p<0.05$). Some cosmetics had only 17.2% and finally Deodorants and shower gels had only 3% ($p<0.05$).

Table 3 Fetal abnormalities causes in preconception or during pregnancy

Factor		n	%	*p*
Anti- aging and wrinkles creams	No	296	73.8%	0.000**
	Yes	105	26.2%	
Acne creams	No	197	49.1%	*0.727*
	Yes	204	50.9%	
Skin lightening creams	No	177	44.1%	0.019**
	Yes	224	55.9%	
Hair products such as: hair dyes - hairspray - hair removal creams	No	97	24.2%	0.000**
	Yes	304	75.8%	
Deodorants and shower gels	No	389	97%	0.000**
	Yes	12	3%	
some cosmetics	No	332	82.8%	0.000**
	Yes	69	17.2%	
***p* is significant at 0.05**				

The period of using dermatological agents/cosmetics during pregnancy may cause fetus abnormalities.

Table (4) presents the knowledge of The period of using dermatological agents/cosmetics during pregnancy may cause fetus abnormalities, the participants agreed that the most cause is the first 3 months of pregnancy with 78.6% ($p<0.05$), comparing the other period which had very low percentage: 3 months preconception had a percentage of 13.2% ($p<0.05$), 1 month preconception had percentage of 10% ($p<0.05$). The second 3 months of pregnancy had percentage of 9.7% ($p<0.05$), and the third 3 months of pregnancy had percentage of 5.7% ($p<0.05$).

Table 4 Period of using dermatological agents/cosmetics during pregnancy may cause fetus abnormalities

Factor		n	%	*p*
3 months preconception	No	348	86.8%	0.000**
	Yes	53	13.2%	
1-month preconception	No	361	90%	0.000**
	Yes	40	10%	

The first 3 months of pregnancy	No	86	21.4%	0.000**
	Yes	315	78.6%	
The second 3 months of pregnancy	No	362	90.3%	0.000**
	Yes	39	9.7%	
The third 3 months of pregnancy	No	378	94.3%	0.000**
	Yes	23	5.7%	
***p* is significant at 0.05**				

The fetal abnormalities you may think be caused by the use dermatological agents/cosmetics in preconception or during pregnancy

Table (5) presents the knowledge of the fetal abnormalities you may think be caused by the use of dermatological agents/cosmetics in preconception or during pregnancy, the participants agreed that the most cause is the neuro develop problems with 69.3% ($p<0.05$), comparing the other causes which below 50% of total: abortion had percentage of 46.6% $p>0.05$), mental illness was 43.6% ($p<0.05$), genital abnormalities had 35.2% ($p<0.05$), low birth weight had 33.9 ($p<0.05$), preterm had 27.7 % ($p<0.05$), stillbirth had 26.4% ($p<0.05$), and finally thyroid problems had 24.7% ($p<0.05$).

Table 5 The fetal abnormalities you may think be caused by the use of dermatological agents/cosmetics in preconception or during pregnancy

Factor		n	%	*p*
Genital abnormalities	No	260	64.8%	0.000**
	Yes	141	35.2%	
neuro develop problems	No	123	30.7%	0.000**
	Yes	278	69.3%	
Thyroid problems	No	302	75.3%	0.000**
	Yes	99	24.7%	
Mental illness	No	226	56.4%	0.011**
	Yes	175	43.6%	
preterm	No	290	72.3%	0.000**
	Yes	111	27.7%	
low birth weight	No	265	66.1%	0.000**
	Yes	136	33.9%	
Abortion	No	214	53.4%	*0.178*
	Yes	187	46.6%	
stillbirth	No	295	73.6%	0.000**
	Yes	106	26.4%	
***p* is significant at 0.05**				

4. DISCUSSION

Our study reported that age of 21-25 years old represents of 61.8% of the participants from 401 reproductive aged women. A lot of women participations well educated (87%) held bachelor's degree. In the comparison between the marital status, the participation of unmarried women obtained a higher rate (66.8%) than that of married women in this study (29.7%).

There are answers counted 52.9% of the participants about check ingredients before purchasing dermatological agents/cosmetics. Skin is the bigger surface of the body expose to external environment in both involuntarily and voluntarily way, due dermatological agents or cosmetic use. A lot of these products are used and applied daily in different ways, consequently, these products for enhancing our personal hygiene and appearance and should to be harmless (Panico et al., 2019). It has been suggested that most consumers give little thought (8.2%) to the personal care products they purchase for daily use and may assume these products are safe. However, some of them do contain Chemicals that rise specific concerns for childbearing women which may effect

on fetal growth, birth outcomes, infant mortality and morbidity, disease of thyroid gland, respiratory conditions, neurological problems, and cancers (Center for Disease Control and Prevention, 2010; Center for Disease Control and Prevention, 2011; Chalupka & Chalupka, 2010; Dott et al., 2010; Dunagan et al., 2011; Sutton et al., 2012; Woodruff et al., 2011).

Also, these products contain numerous potentially harmful chemical substances including plasticizers, bisphenol A, parabens, synthetic dyes, benzophenones, antimicrobials, dioxane, formaldehyde and heavy metals (Cécile Marie et al., 2016). Chemicals passing through the placenta and breast milk amplify exposure risks for infants and children potentially affecting child health (Sutton et al., 2012). In our research, 91.8% ($p<0.05$) of the participants had known that some dermatological agents/cosmetics are not safe to use in preconception or during pregnancy. After asked the women if Relative or people have fetal abnormalities, the results formed (5.7%). dermatological agents and cosmetics have environmental and human health significance because they exhibit a wide range of toxic and chronic health effects, such as central nervous system conditions, reproductive problems, developmental disorders, tumors, heart disease, renal problems, lung damage, dermatitis and hair loss. Many are implicated as endocrine disruptors and respiratory toxins. The use of cosmetics has been known to cause sensitization, dermatitis, allergic reactions and to be an important route of exposure to metals in humans (Chukwujindu et al., 2016).

In our study when asked specifically which personal care product had the most precarious effects in their opinion, 75.8% ($p<0.05$) mentioned the hair products such as: hair dyes - hairspray - hair removal creams. Skin lightening creams were declared as second harmful with 55.9% ($p<0.05$), while 50.9% ($p>0.05$) thought Acne creams will most probably have an effect on the foetus. On the other hand, only 26.2% ($p<0.05$) chose wrinkles creams and anti-aging. Meanwhile, in a study conducted in France when women were asked if they consider using cosmetics in pregnancy is harmful almost half of the women (45%) thought it has no risk (Cécile Marie et al., 2016). Another study done among college students when they were asked about personal care products use in general, aapproximately 42% of students thought using them was totally safe, but nearly half (48.6%) the participants were uncertain. Some information deficits regard to the health effects of environmental toxins in personal products and knowledge of these toxic effect on preconception health (Lisa et al., 2015).

A large proportion (78.6%) of the women in our study perceived that the maximum risk to pregnancy by the use dermatological agents and cosmetic products to cause fetal abnormalities can be during first three months of pregnancy. While quite a high percentage thinks that dermatological agents available don't cause any harm to the developing fetus during three months preconception (86.8%), a month before conception (90%), second trimester of pregnancy (90.3%) and the last trimester of pregnancy (94.3%). On the other hand, in French study most of the women (45%) considered that there was no hazard in utilizing cosmetics throughout the pregnancy (Cécile Marie et al., 2016). Women during pregnancy particularly defenseless helpless against the potential dangers of the cosmetics. So, in our study the results are different and it is quite satisfying that the future mothers have some awareness that all cosmetics and dermatological agents are not safe and they have to observe caution while they are using such agents over their skin.

Drugs that pregnant women or the women going to get pregnancy in few months take can influence the fetus in several ways. They can act specifically on the organ systems of the fetus causing harm in the form of abnormal development leading to birth defects, restricted growth, miscarriage or even stillbirth. There is a growing interest in revealing the dermatological agents and cosmetics effects associated with the wide range of fetal abnormalities. In this survey the most women think is dermatological preparations can have association with neurodevelopment delays or disorders (69.3%). They perceived the danger correctly because it has been proven before that Lip products may be a potential source of unhealthy dosage of diverse metals that can be hazardous to the neurodevelopment growth of the fetal if utilized during pregnancy (Hassan Mohamed et al., 2020). The abortion-related to use dermatological agents and cosmetic products was thought to be (53.4%). The result of our study showed that there was no significant relationship between genital abnormalities (64.8%) and cosmetics. Whereas, in a case-control study in the Picardy region showed relation between women uses of hair products during early pregnancy and hypospadias. male rats of in utero exposure to dibutyl phthalate (DBP) on gestational days 13-21, induced a high rate of cryptorchidism (mainly unilateral), hypospadias, infertility, and testicular abnormalities (Elodie Haraux et al., 2017). The variation of awareness of the women in our study was observed. Half of the women expressed the doubts about the relationship of dermatological agents use during pregnancy and mental illness in the developing fetus. Study results did not reveal significant connection between dermatological agents and cosmetics and preterm birth (72.3%) also low birth weight (66.1%) or stillbirth (26.4%). On the other hand, in cohort studies it is demonstrated that the use of personal cosmetics was associated with small for gestational age (23%), but not with preterm birth or low birth weight (Huixia Li et al., 2019). Therefore, cosmetics utilized during pregnancy needs to be reviewed, and used cautiously as much as possible during pregnancy. The proportion of women in our study who think that cosmetics can cause neurodevelopmental problems, endocrine defects, and mental illness was comparable to the findings of Sohag University Hospital study (Hassan Mohamed et al., 2020). Triphenyl Phosphate was found in nail polish used during pregnancy has been related to reproductive and developmental toxicity,

neurotoxicity, endocrine effects, affects normal metabolism and cell cycle in many toxicological studies (Huixia Li et al., 2019; Emma et al., 2016; Zhongkun Du et al., 2016). Finally, the physiologic mechanisms can be related to the known harmful effects of hazardous chemical substances in cosmetic products during fetus development.

5. CONCLUSION

Majority of participants believe that harmful dermatological agents can affect only during first 3 months of pregnancy and can cause neurodevelopment delay in the fetus but are not associated with genital, thyroid or mental illness nor they can cause abortions, stillbirths, preterm labors.

Recommendations and Limitations

A major limitation of this study was the use sample of women in Hail city, located in north-western of Kingdom of Saudi Arabia. Due to the amount of this population, results are less generalizable in KSA. In addition, the study sample included only female in reproductive age. Although this focused study saved time and effort, it may have biased the study because only in Hail city, KSA. Future studies may overcome these limitations by take a larger more diverse sample from a broader area in Saudi Arabia.

Authors' contributions

MTS searched for a topic and drafted survey questions, designed and collected. Also write introduction and part of discussion, as SAE helped collected questionnaire, write methodology and part of discussion. RTD also share in collected some questionnaire, part of discussion and conclusion. NP she is research Supervisor and helps us to write abstract and our guidance. All authors share in analyzed and interpreted data. All authors have critically reviewed and approved the final draft and are responsible for the content and similarity index of the manuscript.

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Conflict of Interest

The authors declare that there are no conflicts of interests.

Informed consent

Written informed consent was obtained from all individual participants included in the study. Additional informed consent was obtained from all individual participants for whom identifying information is included in this manuscript.

Ethical approval

The study was approved by the Medical Ethics Committee of Hail University (ethical approval code: 1792/5/42).

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Data and materials Availability

All data associated with this study are present in the paper.

Peer-review

External peer-review was done through double-blind method.

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