



UNIVERSITI PUTRA MALAYSIA

***KNOWLEDGE AND PRACTICES OF PHTHALATE RELATING TO
USAGE OF PERSONAL CARE PRODUCTS***

**NURUL NURSUHADA BT MUSTAPHA
DEPARTMENT OF ENVIRONMENTAL AND OCCUPATIONAL
HEALTH
FACULTY OF MEDICINE AND HEALTH SCIENCES
UNIVERSITI PUTRA MALAYSIA
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**KNOWLEDGE AND PRACTICES OF PHTHALTE RELATING TO
USAGE OF PERSONAL CARE PRODUCTS**

BY

NURUL NURSUHADA BT MUSTAPHA

**Thesis submitted in fulfillment of the requirement for the degree of Bachelor Science
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ABSTRACT

KNOWLEDGE AND PRACTICES OF PHTHALATE IN RELATION TO THE
USAGE OF PERSONAL CARE PRODUCTS

NURUL NURSUHADA M. SALIZA M.E

Introduction: Phthalates are multifunctional chemicals that are used in a variety of consumer products including cosmetics and personal care. These harmful chemicals were also known to affect the human health such as endocrine and reproductive system problems. **Objectives:** This study was conducted to compare the knowledge and practices of phthalate relating to usage of personal care products between science based and non-science based students of Universiti Putra Malaysia. **Methodology:** This cross sectional study was conducted among 320 students which the equal proportion for science based faculty (160) and non-science based faculty (160). The collection of data was done from February 2012 until April 2012. A set of pre-tested questionnaire was conducted before the study was done. A set of questionnaire was used to obtain socio-demographic, knowledge about phthalate and practices on using personal care products. **Results:** This study found that the knowledge on phthalate between these two groups was generally poor but the science based students had good score rather than non science based. The results show there was a significant difference in knowledge relating to phthalate between science based student and non science based students where $Z = 2.045$, $p = < 0.05$ and $X^2 = 5.391$, $p = < 0.02$. There was a significant difference also in practices of using personal care products between sciences based and non-science based students where $Z = 3.723$, $p = < 0.0001$ and $X^2 = 8.079$, $p = < 0.05$. However, there was no significant association found between the knowledge of phthalate and how they were practiced personal care products. **Conclusion:** The students mostly do not know about phthalate and the health effect, but they were able to using personal care products in moderate way. **Recommendation:** For recommendation, the students were advised to take courses relating to environmental health in order to get knowledge and increase their awareness on chemical affecting human health.

Keyword: knowledge, practices, phthalate, personal care products, students

ABSTRAK

PENGETAHUAN DAN AMALAN TENTANG PHTHALATE YANG BERHUBUNGAN DENGAN PENGGUNAAN PRODUK PENJAGAAN DIRI

NURUL NURSUHADA M. SALIZA M.E

Pengenalan: Phthalates merupakan bahan kimia pelbagai fungsi yang digunakan dalam pelbagai produk untuk pengguna termasuk kosmetik dan produk penjagaan diri. Bahan-bahan ini juga dikenal pasti dapat mempengaruhi kesihatan manusia seperti masalah system endokrin dan masalah sistem pembiakan. **Objektif:** Kajian ini telah dijalankan untuk membandingkan pengetahuan tentang phthalate dan amalan berkaitan dengan penggunaan produk penjagaan peribadi diantara pelajar berasaskan sains dan pelajar bukan berasaskan sains di Universiti Putra Malaysia. **Metodologi:** Kajian rentas lintang telah dijalankan di kalangan 320 pelajar dimana mempunyai nisbah yang sama untuk fakulti berasaskan sains (160) dan fakulti bukan berasaskan sains (160). Pengumpulan data telah dijalankan bermula dari bulan Februari 2012 hingga bulan April 2012. Satu set borang pra-uji soal selidik telah dijalankan sebelum kajian itu dilakukan. Satu set borang soal selidik telah digunakan untuk mendapatkan maklumat sosio-demografi, pengetahuan mengenai phthalate dan amalan mengenai penggunaan produk penjagaan diri. Kajian ini mendapati bahawa pengetahuan phthalate antara kedua-dua kumpulan ini pada umumnya rendah tetapi pelajar berasaskan sains mempunyai skor yang baik berbanding pelajar bukan berasaskan sains. **Hasil kajian:** Hasil kajian menunjukkan terdapat perbezaan yang signifikan dalam pengetahuan yang berkaitan dengan phthalate antara pelajar sains dan pelajar bukan berasaskan sains dengan nilai $Z = 2.045$, $p = <0.05$ dan $X^2 = 5.391$, $p = <0.02$. Terdapat perbezaan yang signifikan juga dalam amalan menggunakan produk penjagaan peribadi diantara pelajar berasaskan sains dan pelajar bukan berasaskan sains dengan $Z = 3.723$, $p = <0.0001$ dan $X^2 = 8.079$, $p = <0.05$. Walau bagaimanapun, tiada hubungan yang signifikan ditemui antara pengetahuan mengenai phthalate, dan bagaimana mereka mengamalkan produk penjagaan diri. **Kesimpulan:** Kebanyakannya pelajar tidak tahu mengenai phthalate dan kesannya terhadap kesihatan, tetapi mereka mampu untuk mengamalkan penggunaan produk penjagaan peribadi dengan cara yang sederhana. **Cadangan:** Sebagai cadangan, para pelajar dinasihati supaya mengambil kursus yang berkaitan dengan kesihatan persekitaran untuk mendapatkan maklumat dan meningkatkan kesedaran mereka terhadap bahan kimia yang boleh menjejaskan kesihatan manusia.

Kata kunci: pengetahuan, amalan, phthalate, produk penjagaan diri, pelajar

TABLE OF CONTENTS

TITLE	PAGE
DECLARATION	ii
SIGNATURE OF SUPERVISOR	iii
ACKNOWLEDGEMENT	iv
ABSTRACT	v
ABSTRAK	vi
TABLE OF CONTENTS	vii
LIST OF TABLES	xi
LIST OF FIGURES	xii
LIST OF ABBREVIATIONS	xii

CHAPTER 1: INTRODUCTION

1.1 Introduction	1
1.2 Problem Statement	5
1.3 Study Justification	7
1.4 Definition	8
1.4.1 Conceptual Definition	8
1.4.2 Operational Definition	9
1.5 Conceptual Framework	11

1.6 Research Objectives	13
1.6.1 General Objective	13
1.6.2 Specific Objectives	13
1.6.3 Hypotheses	14

CHAPTER 2: LITERATURE REVIEW

2.1 Phthalates and health	18
2.1.2 Di-n-butyl phthalate (DNBP)	18
2.1.2.1 Hepatic Effects	21
2.1.2.2 Hematological Effects	22
2.1.2.3 Renal Effects	22
2.1.3 Dibutyl Phthalate (DBP)	22
2.1.4 Diethylhexyl Phthalate (DEHP)	23

CHAPTER 3: METHODOLOGY

3.1 Study location	24
3.2 Study design	24
3.3 Study population	25
3.4 Sampling Frame	25
3.5 Sampling method	25

3.6 Sample size	26
3.7 Instrumentation and Data Collection	27
3.8 Statistical analysis	28
3.9 Quality Control (QC)	28
3.10 Ethical issue	29

CHAPTER 4: RESULT

4.1 Study background	30
4.2 Socio-demographic of respondents	31
4.3 Knowledge of Respondent on phthalate	33
4.4 Respondent Practices of using personal care products	34
4.5 Statistical Analysis	37
4.5.1 Association between gender and knowledge on phthalate	37
4.5.2 Association between races and knowledge on phthalate	38
4.5.3 Association between age and knowledge on phthalate	39
4.5.4 Association between gender and practices of using personal care products	41
4.5.5 Association between races and practices of using personal care products	42
4.5.6 Association between age and practices of using personal care products	43
4.5.7 Association between the knowledge and practices of using personal care products	44

CHAPTER 5: DISCUSSION, CONCLUSION, RECOMMENDATION

5.1 Discussion

5.1.1 Socio demographic of respondent 46

5.1.2 Comparison on knowledge of phthalate in personal care products between science based and non science based student 47

5.1.3 Comparison of the practices and risk of phthalate exposure due to usage of personal care products between science based and non sciences based students 48

5.1.4 Association between socio-demographic with knowledge on phthalate and practices of using personal care products between science based and non science based student 49

5.1.5 Association between knowledge on phthalate and practices of using personal care products between science based and non science based student 50

5.2 Conclusion 51

5.3 Recommendation 52

REFERENCES 54

APPENDIX 1 FLOW CHART

APPENDIX 2 GANNT CHART

APPENDIX 3 QUESTIONNAIRE

APPENDIX 4 ETHIC LETTER

APPENDIX 5 RESPONDENT FORM

	LIST OF TABLES	Page
Table 1	Socio-demographic information of respondents	32
Table 2	Comparison of knowledge and practice between science based and non-science based students of UPM	36
Table 3	Association between gender and knowledge of phthalate	38
Table 4	Association between races and knowledge of phthalate	39
Table 5 & 6	Association between age and knowledge of phthalate	40
Table 7	Association between gender and practice of using personal care products	41
Table 8	Association between races and practice of using personal care products	42
Table 9&10	Association between age and practice of using personal care products	43
Table 11	Association between the knowledge of phthalate and practices of personal care products	45

LIST OF FIGURES

		Page
Figure 1	Conceptual framework	12
Figure 2	Knowledge Score between science based and non-science based faculty	34
Figure 3	Practice Score between science based and non-science based faculty	35
Figure 4	Practices of using personal care products in a week	37
Figure 5	Association between knowledge on phthalate and practice of using personal care products	45

LIST OF ABBREVIATIONS

BzBP	benzylbutyl phthalate
CDC	Centers for Disease Control and Prevention
CIR	Cosmetics Ingredients Review
CSTEE	Scientific Committee on Toxicity, Eco-toxicity and the Environment
DBP	dibutyl phthalate
DEHP	di-2-ethylhexyl
DEP	diethyl phthalate
DMP	dimethyl phthalate
EDCs	endocrine disrupting chemicals
EPA	Environmental Protection Agency
FDA	Food and Drug Administration
FPLA	Fair Packaging and Labelling Act
HCWH	Health Care Without Harm
IARC	International Agency for Research on Cancer
SCCP	Scientific Committee on Consumer Products

CHAPTER 1

INTRODUCTION

1.1 Background

Phthalates are esters of phthalic acid and a family of chemicals that have a wide range of applications in consumer goods, including children's toys, building materials, food packaging, cosmetics, personal care products, cleaning materials, pharmaceuticals, and medical devices. United State Environmental Protection Agency (2009) was estimated that globally, over 470 million pounds of phthalates are produced every year and the major (90%) use of phthalates is to impart flexibility and malleability to several plastic materials, including polyvinylchloride (PVC) where the annual production of PVC in Asia was over 16 million tons, accounting for 46.5% of the global production in 2007.

There were multiple human exposure routes for phthalates including oral, inhalation, ingestion, dermal, and intravenous—through transfusions and other medical devices and procedures. The largest source of from di-2-ethylhexyl DEHP

exposure for the general population was diet, followed by inhalation of contaminated indoor air (CERHR, 2000). Exposures in food result from DEHP accumulating in foods and from the leaching of DEHP while processing, packaging, and storing (CERHR, 2000). The single largest use of DEHP was as a plasticizer for poly-vinyl chloride plastic (PVC). DEHP can leach from PVC under certain circumstances, causing direct human exposures (CDC, 2005).

Diethyl phthalate (DEP) exposure results mainly from direct use consumer products containing fragrances and personal care products such as shampoos, scents, soap, lotions, and cosmetics, and from inhalation of air containing these chemicals (Houlihan et al., 2002 & Wolff et al., 2007). Exposure to DEP is also found in products such as toothbrushes, tools, food packaging, insecticides, and aspirin (ATSDR, 1995).

Exposure to dibutyl phthalate (DBP) has been linked most commonly to cosmetics, mainly nail polish, but DBP is also found in pharmaceutical coatings, insecticides, and some printing inks (Houlihan et al., 2002, CDC 2005 & Wolff et al. 2007). Benzylbutyl phthalate (BzBP) is an industrial solvent and found within adhesives, vinyl flooring, sealants, car-care products, and some personal care products such as hair spray (Houlihan et al., 2002, CDC, 2005 & Wolff et al., 2007).

Phthalates are animal carcinogens and can cause fetal death, malformations, testicular injury, liver injury, anti-androgenic activity, teratogenicity, peroxisome

proliferation and especially reproductive toxicity in laboratory animals (ATSDR, 2001).

Several phthalates and their metabolic products have been shown to be developmental and reproductive toxicants affecting particularly male reproductive development (Ema et al. 2001, Gray et al., 2000, Parks et al., 2000, Wilson et al., 2004) and are suspected of having endocrine disrupting or modulating effects (Latini et al., 2004). An endocrine disruptor is a chemical with the potential to alter hormone action within the body (Sharpe et al., 2004). Thus, these chemicals have been found to interfere with the function of the endocrine system, which is responsible for growth, sexual development and many other essential physiological functions both in males and females (Lovekamp-Swan et al. 2003 & Sharpe, 2001).

Phthalate exposure can begin *in utero* and in one study was strongly associated with shorter pregnancy duration (Latini et al., 2003). Another study also found that prenatal phthalate exposure at environmental levels is associated with altered male reproductive development in humans, including shortened anogenital distance (signifying feminization), an increased likelihood of testicular maldescent, small and indistinct scrotum, and smaller penile size (Swan et al., 2005). Later research documented altered male reproductive hormone levels in baby boys most highly exposed to phthalates in their mother's breast milk (Main et al., 2006). Phthalate exposure has also been linked to lower sperm counts, reduced sperm motility, and damaged sperm in men (Duty et al., 2005).

Studies had showed concentrations of phthalates in house dust was associated with asthma and rhinitis in children (Bornehag et al., 2004). Exposure to PVC flooring containing phthalates has also been linked to increased bronchial obstruction during the first two years (Kohn et al., 2000). In adult men, exposure to certain phthalates has been linked to reduced lung capacity at magnitudes similar to those observed with tobacco smoke.

Depending on the exposure level, exposure to DEHP resulted in observed effects on the pituitary, thyroid, thymus, ovaries, testes, lung, kidneys, liver, and blood (CERHR, 2000). Besides that, it is known that bone remodeling is controlled by various hormones and cytokines (Rodan, 1992). An imbalance between bone formation and bone resorption leads to metabolic bone diseases (Parfitt, 1987). Since estrogens deficiency is also liable for important bone diseases, as osteoporosis, the role of estrogens as well as estrogen-mimicking compounds, like phthalates, in regulating activities of bone cells is crucial to understand some bone metabolism pathologies.

According to Environmental Health News (2009), phthalates may soften and even weaken bones. Phthalates used in plastics and beauty products can trigger bone cell death and was finds in the animal study. Phthalates provoke DNA damage that can lead to bone cell death. This study shows how a low-dose exposure to two types of commonly found phthalates has a profound effect on bone cells. Based on the

results, long-term exposure to phthalates could have devastating effects on developing bones in young bodies and accelerate deterioration in aging bones. Estrogen deficiency is responsible for a number of bone diseases such as osteoporosis. For this reason, many are concerned about the effects of phthalate exposure on bone health (Sabbieti et al., 2009). So that, it could be seen if there was a significant difference of knowledge and practices of phthalate relating to usage of personal care products between these two groups.

1.2 Problem Statement

Phthalates was the animal carcinogens and can cause fetal death, malformations, testicular injury, liver injury, anti-androgenic activity, teratogenicity, peroxisome proliferation and especially reproductive toxicity in laboratory animals (ATSDR, 2001). Several phthalates and their metabolic products have been shown to be developmental and reproductive toxicants affecting particularly male reproductive development (Ema et. al., 2001 & Wilson et al., 2004) and was suspected of having endocrine disrupting or modulating effects (Latini et al., 2004). An endocrine disruptor is a chemical with the potential to alter hormone action within the body (Sharpe et al., 2004). Thus, these chemicals have been found to interfere with the function of the endocrine system, which is responsible for growth, sexual development and many other essential physiological functions both in males and females (Lovekamp-Swan et al., 2003 & Sharpe, 2001).

The most critical population, women of childbearing age whose fetuses are exposed in the womb, appear to receive the highest exposures. Estimates based on data published by the CDC researchers in October 2000, indicate that DBP exposures for 3 million women of childbearing age may be up to 20 times greater than for the average person in the population. Center for the Evaluation of Risks to Human Reproduction (CERHR, 2000) , DBP causes a number of birth defects in lab animals, primarily to male offspring, including testicular atrophy, reduced sperm count, and defects in the structure of the penis.

A study of a reference population has shown higher levels of exposure to DEP, DBP and BBP (phthalates used in personal care products) than DEHP, suggesting exposure via these products is the most important human exposure route (Blount, 2000). Young women (20-40yrs) were the most exposed group in the study, which is consistent with a “cosmetics” source as these phthalates are found in products such as nail polishes, perfumes and hair sprays (Blount, 2000). Ingestion of food containing phthalates is also an important route of exposure. Ingestion of phthalates can also occur via their use in the coatings of pharmaceuticals (drugs) and nutritional supplements (Hauser, 2004). Dietary intake (from contaminated food) has been suggested as the most likely single source of phthalate exposure in the general population although exposure via personal care products is clearly also important (Blount, 2000).

1.3 Study Justification

Phthalates was concern in environmental public health because of the high potential for human exposure to phthalates and their demonstrated toxicity in animals. For example, DEHP is a rodent carcinogen (ATSDR, 2002). DEHP, DBP, and several phthalate metabolites, such as monobutyl phthalate (MBP), monobenzyl phthalate (MBzP), and mono-(2-ethylhexyl) phthalate (MEHP), are teratogenic in animals (Ema et al., 2001). Human studies are scarce, but monoethyl phthalate (MEP) has shown an association with sperm DNA damage (Duty et al., 2003).

In Malaysia, there was lack of study regarding the phthalate in personal care products , therefore this study was aim to obtain the information from the respondents regarding the knowledge and their practices due to the usage of personal care products. Besides that, by looking the practices also, this study able to determine the risk of Phthalate by determines the frequency of usage of personal care products in a week by the respondents.

1.4 Definition of term

1.4.1 Conceptual definition

1.4.1.1 Knowledge

The facts, feelings, or experiences known by a person or group of people; the state of knowing; awareness, consciousness, or familiarity gained by experience; specific information about a subject

1.4.1.2 Practices

Perform (an activity) or exercise (a skill) repeatedly or regularly in order to improve or maintain one's proficiency.

1.4.1.3 Personal care products

Personal care products were used for beautification and in personal hygiene purpose.

1.4.1.4 Phthalate

Phthalates are multifunctional chemicals that are used in a variety of consumer products including cosmetics and personal care

1.4.1.5 Phthalate exposure

There are multiple human exposure routes for phthalates including oral, inhalation, ingestion, dermal, and intravenous—through transfusions and other medical devices and procedures.

1.4.2 Operational definition

1.4.2.1 Knowledge

Regarding knowledge about phthalate, the total score was 9. Participants who scored 7-9 ($\geq 75\%$) were ranked as “good”, scored 0-6 ($\geq 70\%$) as “fair”.

1.4.2.2 Practices

Regarding practice of using personal care products, the total score is 36. Participants who scored 27-36 (>75%) were ranked as “frequent users” of personal care product usage, scored 0-26 (>70%) as “occasional users”.

1.4.2.3 Personal care products

Examples of products are scented lotion, shampoo, perfume, aftershave, nail polish, and hair spray.

1.4.2.4 Phthalate

Phthalate exposure can be measure by determine the frequency of use of personal care products in a week among respondents.

1.4.2.5 Phthalate exposure

Urinary phthalate metabolites are used as biomarkers of recent human exposure to phthalates.

1.5 Conceptual framework

Figure 1 show the conceptual framework of this study where it highlighted the source mechanism and process how the exposure of products contain phthalate can effects the human body and lead the occurrence of various diseases due to the presence of endocrine disruptor disease in human body.

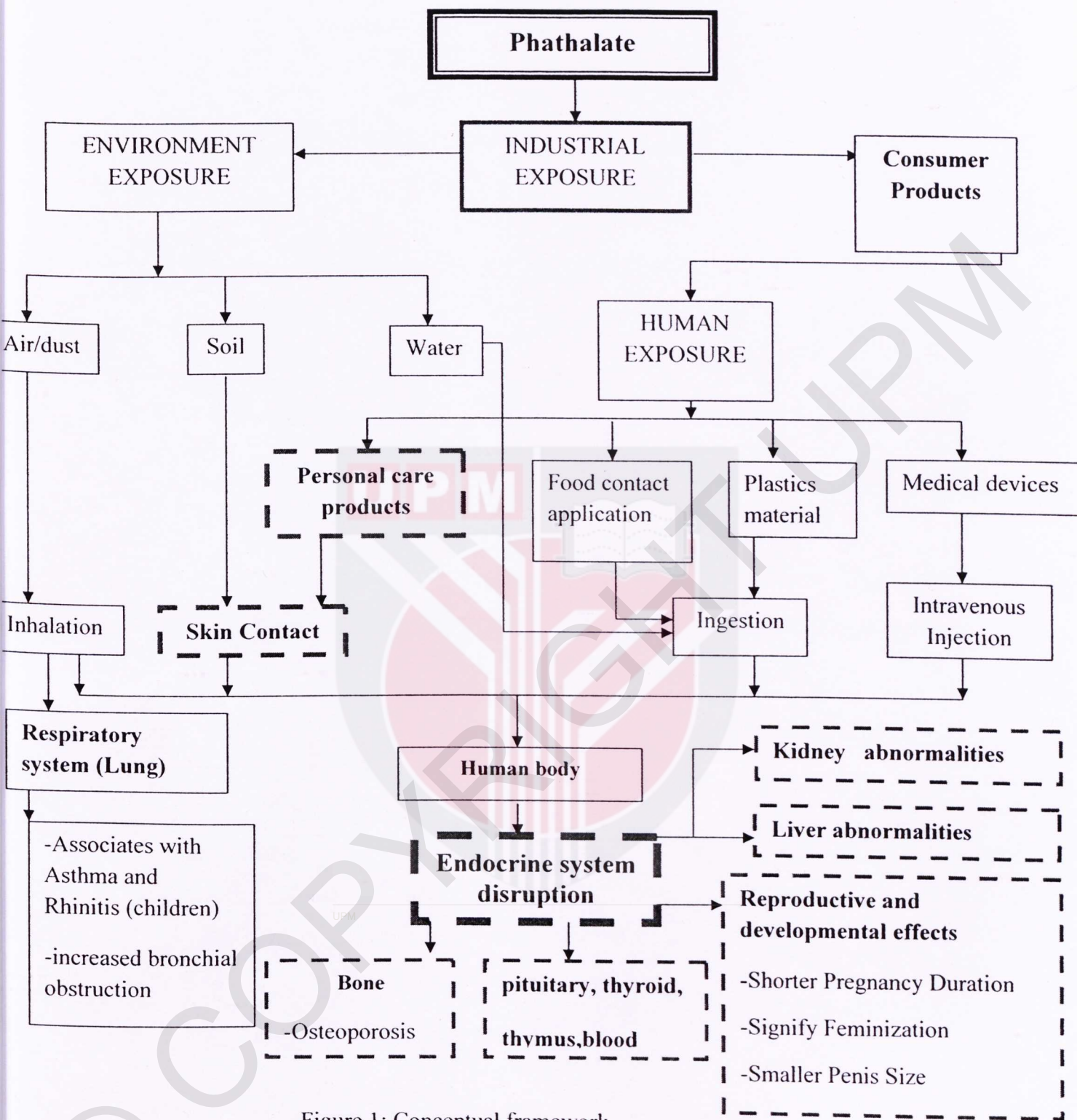


Figure 1: Conceptual framework

1.6 Study Objective

1.6.1 General Objectives

To determine the knowledge and practices of phthalate relating to usage of personal care products among students at UPM.

1.6.2 Specific objective

1. To determine the socio-demographic of students at UPM.
2. To compare the knowledge of phthalate in personal care products between science based and non science based student at UPM
3. To compare the practices of using personal care products between science based and non science based student at UPM
4. To compare the risk of phthalate exposure based on practices of using personal care products between science based and non sciences based students at UPM
5. To determine the association between socio-demographic and knowledge on phthalate between science based and non science based student at UPM
6. To determine the association between socio-demographic and practices on phthalate between science based and non science based student at UPM

7. To determine the association between the knowledge of phthalate and practices of using personal care products among science based and non science based student at UPM

1.7 Hypothesis

1. There is a significant difference of knowledge on phthalate between science based and non science based student at UPM
2. There is a significant difference of practices of personal care products between science based students and non science based student at UPM
3. There is significant difference of risk of phthalate exposure based on practices using personal care products between science based and non science based student at UPM
4. There is a significant difference of the socio-demographic and the knowledge on phthalate between science based and non science based student at UPM
5. There is a significant difference of the socio-demographic and the practices on phthalate between science based and non science based student at UPM
6. There is a significant association between the knowledge and practices of using personal care products among science based and non science based student at UPM

CHAPTER 2

LITERATURE REVIEW

A study done in women residents of northern Mexico was shown that results was consistent with previous studies carried out in other countries, which report the use of personal care products as a potential source of phthalate exposure (Houlihan et al., 2002 & Koo et al., 2004). In addition, several investigators have reported positive associations between the urinary concentrations of methyl ethyl phthalate (MEP) and the use of personal care products in pregnant women (perfume, deodorant, lipstick, nail polish, and/or hand/face cream) (Koo & Lee, 2004), men (cologne and after shave cream) (Duty et al., 2005).

While phthalates are of generally low acute toxicity, for some of them there are serious concerns over their endocrine disrupting properties and their potentially adverse effects on male reproductive development, with fetal animals being particularly sensitive. For example, US researchers have found that DEHP can cause malformations of the reproductive system in male rats through an endocrine-

disrupting mechanism (Gray et al., 1999). Exposure to hormone disrupting chemicals like phthalates are suspected of being one of the factors contributing to observed trends of declining fertility, increased incidence of testicular cancer and falling sperm counts in European men. In the case of phthalates, this is based on observations of their effects in rodent studies which include malformations of the reproductive system, testicular tumors and effects on sperm production (Foster, 2006).

These effects on the male reproductive system have been collectively termed testicular dysgenesis syndrome (TDS) (Skakkebaek et al., 2001) and it is hypothesised that they are all manifestations of disturbed prenatal testicular development that result of “feminisation” of the developing reproductive tract of male foetuses in the womb (Bay et al., 2006 & Skakkebaek et al., 2001). It is thought that some phthalates, due to their anti-androgenic (male hormone suppressing) properties, are playing a role in this phenomenon.

Family of endocrine disrupting chemicals (EDCs) includes higher-molecular-weight phthalates such as bis(2-ethylhexyl) phthalate (DEHP, a common polyvinyl chloride (PVC) additive), dibutyl phthalate (DBP), and butyl benzyl phthalate (BBP), and also lower-molecular-weight phthalates such as dimethyl phthalate (DMP) and diethyl phthalate (DEP), which is commonly used as a solvent for fragrance. All of these are used in food packaging. The higher-molecular-weight phthalates DEHP, DBP, and BBP are identified as EDCs based on inhibition of testosterone synthesis

and effects on the developing male reproductive system in rodents, whereas the lower-molecular-weight phthalates DEP and DMP did not induce these effects (Gray et al. 2000). Some epidemiological evidence shows associations between urinary excretion of phthalate metabolites and effects on the developing male reproductive system (Swan, 2008), male hormone levels and semen quality (Hauser, 2008 & Meeker et al. 2007), and neurobehavioral end points (Engel et al. 2009).

Phthalates used in plastics and beauty products can trigger bone cell death and was found in the animal study where provoked the DNA damage that led to bone cell death (Sabbieti, 2009). Another study also shows how a low-dose exposure to two types of commonly found phthalates has a profound effect on bone cells. Based on the results, long-term exposure to phthalates could have devastating effects on developing bones in young bodies and accelerate deterioration in aging bones. Estrogen deficiency is responsible for a number of bone diseases such as osteoporosis. For this reason, many are concerned about the effects of phthalate exposure on bone health.

2.1 Phthalates and health

2.1.2 Di-n-butyl phthalate (DNBP)

DNBP is used in many products that are made from plastic. When it is in anything, di-n-butyl phthalate is at a higher level when that product is new. There is less in products that are old. Because di-n-butyl phthalate may be in some toys, there is a concern that children chewing on such toys might be exposed. No measurements have yet been made to show whether children are exposed in this way. DNBP appears to have relatively low toxicity, and large amounts are needed to cause injury. Adverse effects on humans from exposure to di-n-butyl phthalate have not been reported. In animals, eating large amounts of di-n-butyl phthalate can affect their ability to reproduce.

In male animals, sperm production can decrease after eating large amounts of di-n-butyl phthalate. However, when exposure to di-n-butyl phthalate stops, sperm production seems to return to near normal levels. The levels of di-n-butyl phthalate that cause toxic effects in animals are about 10,000 times higher than the levels of di-n-butyl phthalate found in air, food, or water. Exposure to high levels of di-n-butyl phthalate might cause similar effects in humans as in animals, but this is not known.

In animals, large amounts of di-n-butyl phthalate repeatedly applied to the skin for a long time cause mild irritation. Although the available data do not indicate that di-n-butyl phthalate causes cancer, this needs to be more thoroughly studied.

The primary effects seen in animals following exposure to di-n-butyl phthalate are developmental and reproductive alterations. No data are available for developmental or reproductive effects in humans. Animal studies have shown that the development of the male reproductive system, especially the seminiferous epithelium of the testes, may be disrupted by in utero exposure to high doses of di-n-butyl phthalate during the critical period for reproductive development. Other developmental effects may also occur following in utero or perinatal exposure, and include increases in post implantation losses, decreases in the number of live fetuses per litter, decreases in fetal and pup body weights, and increases in incidences of external, skeletal, and internal malformations. Reproductive effects are also seen in adult animals exposed to di-n-butyl phthalate. Fertility is reduced in male and female animals, and is related to testicular atrophy and seminiferous tubule damage in males, the mechanism in females is not known. Reproductive alterations may also extend to the offspring of exposed animals, and may include reduced fecundity and decreased sperm production. Minor liver, hematological, and renal effects, as well as changes in body weight, have also been observed in exposed rats.

Species differences in susceptibility to testicular damage have been noted. More severe testicular damage was seen in rats and guinea pigs than in mice and hamsters at the same dose level. This is thought to be due, at least in part, to differing levels of β -glucuronidase activity that may result in different levels of the free primary metabolite, mono-n-butyl phthalate, in the testes.

No human data are available for developmental effects of di-n-butyl phthalate. Animal studies have shown that acute- and intermediate-duration oral exposure to di-n-butyl phthalate causes a number of developmental effects, including increases in post implantation losses, decreases in the number of live fetuses per litter, decreases in fetal/pup body weights, increases in incidences of external, skeletal, and internal malformations, and altered reproductive development in the offspring. The lowest levels at which these effects were seen were varied widely. Decreases in the number of live pups/litter were seen following doses as low as 80 mg/kg/day in rats and 1,950 mg/kg/day in mice. Decreases in anogenital distance, increases in undescended testes, and increases in abortions were seen at 500 mg/kg/day in rats, and increases in the incidence of external and skeletal malformations were seen at 750 mg/kg/day in rats. As discussed before, increased incidence of retained nipples and areolas (an anti-androgenic effect) in male rat pups exposed in utero is the basis for the acute-duration minimal risk level (MRL) for oral exposure. The lowest dose level resulting in disruption of androgen-regulated reproductive development in rats was 100 mg/kg/day. This is well above the levels

expected to be encountered by the general population or at a well-regulated workplace.

No human data are available for reproductive effects of di-n-butyl phthalate. Animal studies have shown that di-n-butyl phthalate affects fertility in both males and females. Decreases in fertility indices, reduced pregnancy rates, and shortened length of gestation have been seen in rodents exposed to di-n-butyl phthalate before or during gestation. Testicular atrophy has been observed in male rats, mice, and guinea pigs, but not hamsters, acutely exposed to di-n-butyl phthalate however, rats are much more sensitive to the testicular effects than other animals examined.

2.1.2.1 Hepatic Effects

Mild liver effects have been seen in rats and mice orally exposed to di-n-butyl phthalate for acute or intermediate durations. These effects were increased liver weight, increased microsomal enzyme activity, inhibition of mitochondrial respiration, liver necrosis, and peroxisome proliferation. The lowest dose level at which effects were seen was 348 mg/kg/day.

2.1.2.2 Hematological Effects

Hematological effects have been observed in rats and mice exposed orally to high dose levels of di-n-butyl phthalate. These included anemia, decreased hematocrit, hemoglobin, and red blood cell levels.

2.1.2.3 Renal Effects

Renal effects of di-n-butyl phthalate were limited to decreased kidney weight in mice and increased kidney weight in rats exposed to high dose levels.

2.1.3 Dibutyl Phthalate (DBP)

In contrast to the phthalates previously discussed, dibutyl phthalate (DBP) has not been used as a plasticizer in PVC for a number of years. However, it is used in latex adhesives, as a solvent in dyes, as a plasticizer in cellulose plastics, in coatings of medications, and for a variety of purposes in cosmetics. It may also be found in food due to leaching from DBP-containing products that come into contact with food during processing or storage. Use of DBP in plastic toys appears rare because the results of careful analyses of toys indicate that it is either not present or

present at low levels. From monitoring data, food seems to be the main source of human exposure to DBP, although air and dust appear to be significant contributors in infants and children, and personal care products may be significant sources of exposure in teens, especially females.

2.1.4 Diethylhexyl Phthalate (DEHP)

Diethylhexyl phthalate (DEHP) is found in a variety of products, including building materials, medical devices (such as tubing and drainage bags), and paints and adhesives. It is also found in a variety of food products due to leaching that may occur during food production and storage. DEHP was used in some toys but not those designed for infants and toddlers.

Results of laboratory studies on the toxicity of DEHP suggest that doses of at least 14 mg/kg/d in rats are needed to produce reproductive and/or developmental toxicity, such as decreased testicular weight and seminiferous tubular atrophy, which is the most sensitive effect in rats. The no-effect level in these studies is 4.8 mg/kg/d. While DEHP produces liver tumors in rodents exposed to high doses over a lifetime, consideration of the mechanism by which this occurs leads to the conclusion that DEHP is not likely to be carcinogenic in humans (IARC, 2000).

CHAPTER 3

METHODOLOGY

3.1 Study location

This study was done at Faculty of Sciences and Faculty of Economy and Management in University Putra Malaysia, Selangor.

3.2 Study design

Cross sectional study was used in this study and was done within 4 months. Appendix 1 shows the flow chart on how the process of data collection was done. Appendix 2 was showed the estimation duration of the activity for this study completed.

3.3 Study population

The target populations were students from Universiti Putra Malaysia (UPM).

3.4 Sampling Frame

For this research, the science based and non - science based student from both faculties of UPM were listed out and drawn randomly by researcher.

3.5 Sampling method

Stratified random sampling method was used in this study where the list of all faculties in UPM were drawn randomly for the science based and none science based faculty. While for the chosen of respondents, quota sampling was used.

3.6 Sample size

According to the (Neuman et al., 1997) the sample will be selected using the proportion formulae:

The population in the study area as the following:

- Faculty of Science = 1584
- Faculty of Economy and management = 1015

As the population exceeds 1000 people, we used the moderately large population formulae which is about 10 % of population was yield. The calculation as follows:

- Faculty of Science = $\frac{10}{100} \times 1584 = 158$ respondents
- Faculty of Economy and management = $\frac{10}{100} \times 1015 = 102$ respondents

The total of the respondents for study area were 260 respondents.

3.7 Instrumentation and Data Collection

A set of pre –tested questionnaire was developed based on information in gathered from previous study to assess the knowledge and practices of phthalate relating to usage of personal care products by using two point Likert type scale. Appendix 3 showed a set of questionnaire used for this study where it was divided into 3 parts which was Part A, Part B, and Part C. Part A was about the background information of respondent such as age, gender, races, course taken, batch and faculty.

Part B was designed to know the general knowledge of respondent. Nine questions were asked in this section where the respondent should answer Yes or No. The questionnaire asked whether they had any idea about phthalate, about any products contain phthalate, and the health effect of phthalate exposure to human. The questions related to the health effect were asked due to use of products contain phthalate were causing early onset of puberty, interfering with the male reproductive tract development, lower the testosterone level in adolescent males and causing lower sperm count in adult males.

Part C includes the question regarding the practices of personal care products usage. The frequency of personal care products used in a week was taken into account.

3.8 Statistical analysis

The data was analyzed by using the latest SPSS version 19. Pearson Chi-square, Spearman Rho and Man -Whitney test were used to compare the results between two groups of faculties. All tests were two-tailed and defined significance as $p < 0.05$.

3.9 Quality Control (QC)

In this study, the respondent was randomly selected to control selection bias. Therefore all the students in faculty had the same probability of being selected in this study.

Questionnaire was test for its validity and pre-test on 20 UPM students from a similar environment to the study population in order to assess question clarity, possible redundant issues, and layout and time requirement. The data from the pre-

tested study were not subsequently included in the assessment. Respondents were guided and briefed by the researcher herself so as to minimize any biases that could arise.

3.10 Ethical issue

The approval had been obtained from Medical Researcher Ethic Committee, Universiti Putra Malaysia (Appendix 4). All information about the respondents was confidential. Written consent had been obtained from the respondents prior to the study (Appendix 5 and 6).

CHAPTER 4

RESULT

4.1 Study background

The purpose of this study was to compare the knowledge and practices of phthalate relating to usage of personal care product between two groups of respondents. This study was conducted among the students from University Putra Malaysia. From 16 faculties in UPM, two faculties were randomly selected to represent science based and non science based students. Science based faculty represented by Faculty of Science while non Science based faculty represented by Faculty of Economy and management. Total of 160 students were randomly recruited from each faculties

4.2 Socio-demographic of respondents

The total respondents for the science based and non-science based were almost in the equal proportion which 50% from science based faculty and 50% from non science based faculty. Most participants were female which 95.9% while the men were 4.1%. Majority of respondents were Malay were 75% and 25% were non Malay. The demographic data comparing between two groups were concluded in Table 1. There was no significant association between batch, gender, age and races with knowledge on phthalate and practices of using personal care products.

Table 1 Socio Demographic information of respondents (N=320)

Variables	Science Based Student	Non Science Based Student
	Frequencies (%) n=160	Frequencies (%) n=160
Course		
BSc (Chemistry)	25 (15.6)	-
BSc (Industrial Chemistry)	2 (1.25)	-
BSc (Petroleum Chemistry)	12 (7.5)	-
BSc (Physics)	19 (11.9)	-
BSc (Instrumental)	15 (9.4)	-
BSc (Material)	16 (10.0)	-
BSc (Statistic)	12 (7.5)	-
BSE (Chemistry)	17 (10.6)	-
BSE (Mathematic)	42 (26.2)	-
BA (Accountancy)	-	86 (53.8)
BA (Business)	-	59 (36.9)
BA (Economic)	-	15 (9.3)
Batch		
1 st year	14 (8.8)	46 (28.8)
2 nd year	63 (39.4)	60 (37.5)
3 rd year	54 (33.8)	29 (18.1)
4 th year	29 (18)	25 (15.6)
Gender		
Male	4 (2.5)	9 (5.6)
Female	156 (97.5)	151 (94.4)
Races		
Malay	130 (81.3)	110 (68.8)
Non Malay	30 (18.7)	50 (31.2)

4.3 Comparison knowledge on phthalate of Respondent

The total score of phthalate's knowledge was 9. Respondents that scored for 5-6($\geq 50\%$) was declare as "fair", and scored 0-4($< 50\%$) as "poor". More than 80 % of respondents scored for 0-4. This shows that both faculties had poor knowledge on phthalate. The frequencies of knowledge score was shown in Figure 2 showed that non science based students had poor knowledge (86.9 %) compared to science based students (76.9%). The respondents were tested on the knowledge of phthalate whether they have idea about phthalate, have any knowledge on any products contain phthalate and the health effect of phthalate exposure to human. Questions related to the health were the effect due to usage of products contain phthalate were causing early onset of puberty, interfering with the male reproductive tract development, lower the testosterone level in adolescent males and causing lower sperm count in adult males. The result also was showed that the science based faculty had the higher percentage of score for fair knowledge which 23.1% while the non science based faculty only 13.1%.

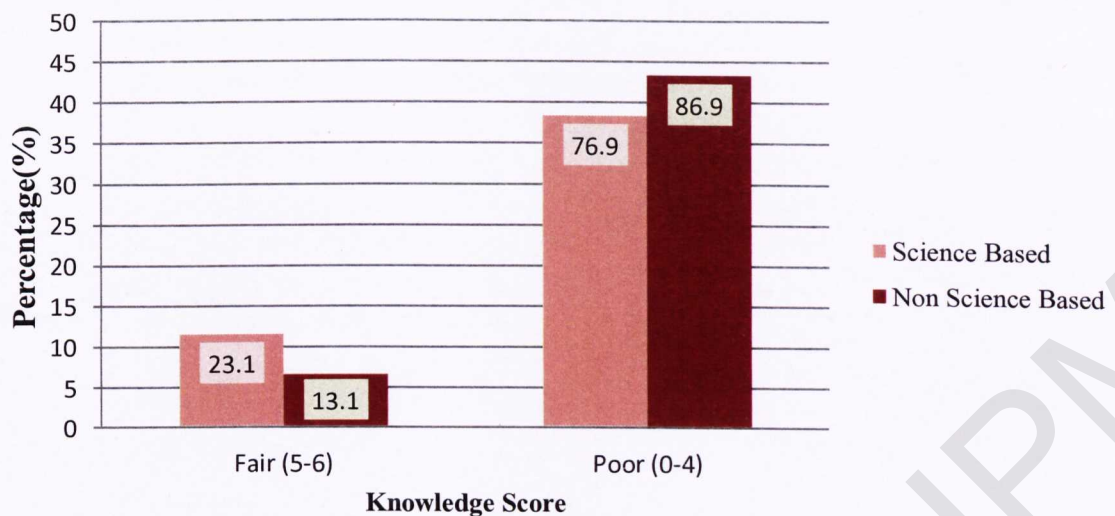


Figure 2 Knowledge score of phthalate between Science Based and Non Science Based Faculty

4.4 Comparison of Respondent's Practices on using personal care products

The total score for practices of using personal care products was 36. Participants who scored 27-36 ($>75\%$) were ranked as “frequent users” of personal care product usage and scored 0-26 ($>50\%$) as “occasional users. Regarding practices of using personal care products contain phthalate, the frequencies of the products used were displayed in Figure 3. Non Science based faculty shown 89.4% for the practices score for occasional user that higher than Science based faculty which was 81.9%. While for the frequent user, the practices score of Science based faculty shown 18.1% which was higher than Non Science based faculty which was 10.6%.

The questionnaire which includes in items relating to the practices of using personal care products in a week by the respondents were shown in Figure 4. Based on the figure, deodorant (78.80%), fragrance (58.80%), hand and body lotion (53.80%), body shower/soap (100%) and facial cleanser (99.40%) were shown as usually personal care products used by respondents in a week. Shampoo was shown as sometimes personal care products used (92.50%) while hair gel (79.70%), hair spray (88.40%) and nail polish (85%) were shown higher percentage of never for the practices of using personal care products in a week.

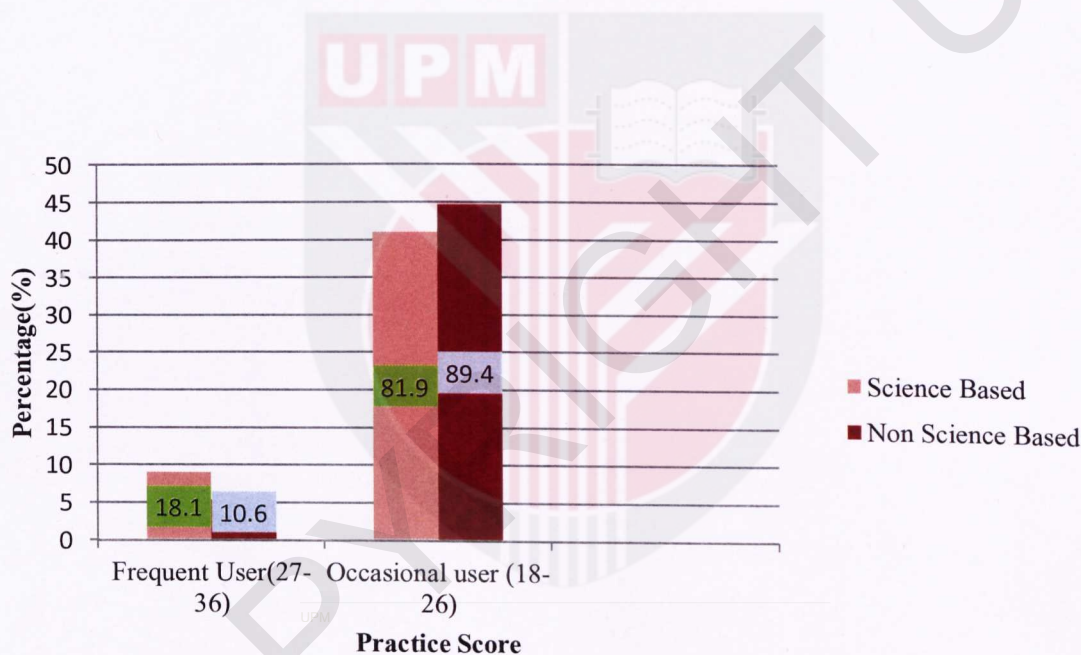


Figure 3 Practices score of phthalate between Science Based and Non Science Based faculty

Table 2 Comparison of knowledge and practices of phthalate in relation to the usage of personal care products

Variables (Score)	Science based (N=160)		Non Science based (N=160)		Mean Rank	f (%)	Mean Rank	Total (%)	Statistical analysis
	Median (IQR)	Range	Median (IQR)	Range					
Knowledge									
Fair (4-6)	3(0)	0-6	3(0)	0-8	170.44	37(23.1)	150.56	58 (18.1)	Z = 2.045 p = <0.05*
Poor (0-3)						123(76.9)		262 (81.9)	X ² = 5.391 p = < 0.05
Practices									
Frequent user (27-36)	2(0)	11-32	2(0)	17-31	179.42	29(18.1)	141.58	46 (14.4)	Z = 3.723 p = <0.0001** X ² = 8.079 p = <0.05
Occasional user (0-26)						131(81.9)		274 (85.6)	

Z:Mann-Whitney test

X²:Chi Square test * significant at p < 0.05 **significant at p< 0.0001

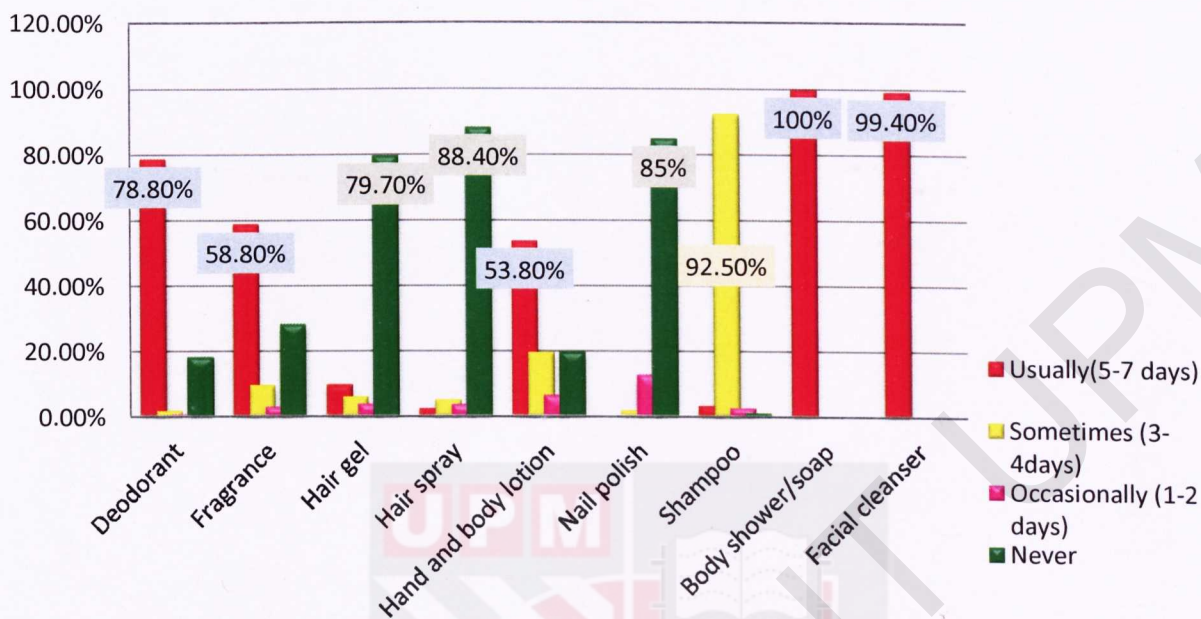


Figure 4 Practices of using personal care products in a week

4.5 Statistical Analysis

4.5.1 Association between gender and knowledge on phthalate

Chi Square test was used to determine the association between the socio-demographic (gender) and knowledge on phthalate among respondent. The knowledge was categorized under 2 scores which was fair (4-6) and poor (0-3).

Table 3 showed there was no significant association between the gender and knowledge of phthalate among respondent.

Table 3 Association between gender and knowledge on phthalate (N=320)

Socio-demographic	Knowledge		x ²	p
	Fair	Poor		
Gender				
Male	2	11	0.069	0.793
Female	56	251		
Total (N)	58	262		

4.5.2 Association between races and knowledge on phthalate

Chi Square test was used to determine the association between the socio-demographic (races) and knowledge on phthalate among respondent. The knowledge was categorized under 2 scores which is fair (4-6) and poor (0-3). Results in Table 4 showed there was no significant association between the races and knowledge of phthalate among respondent.

Table 4 Association between races and knowledge on phthalate (N=320)

Socio-demographic	Knowledge		x ²	p
	Fair	Poor		
Races				
Malay	45	195	0.253	0.615
Non Malay	13	67		
Total (N)	58	262		

4.5.3 Association between age and knowledge on phthalate

Two statistical analyses were used to determine the association between the age and the knowledge of phthalate relating to usage of personal care products among respondent. The first statistical test was Spearman's rho which used to analyze the continuous data. Another statistical test used was Chi-Square test to analyze categorical data for the association between the age and the knowledge relating to usage of personal care product. Results in Table 5 and Table 6 showed there were no significant associations between the age and the knowledge relating to usage of personal care products.

Table 5 Association between age and knowledge on phthalate (N=320)

Socio-demographic	Knowledge	
	r	p
Age (Years)	-0.066	0.238

r value according to Spearmen's rho

Table 6 Association between age and knowledge on phthalate (N=320)

Socio-demographic	Knowledge		χ^2	p
	Fair	Poor		
Age (Years)				
19-22	46	210	0.021	0.885
23-26	12	52		
Total (N)	58	262		

4.5.4 Association between gender and practices of using personal care products

Result of Chi Square test in Table 7 shown there was no significant association between gender and practices on Phthalate relating to usage of personal care products.

Table 7 Association between gender and practices of using personal care products (N=320)

Socio-demographic	Practice		x ²	p
	Frequent user	Occasional user		
Gender				
Male	4	9	3.071	0.215
Female	42	265		
Total (N)	46	274		

4.5.5 Association between races and practices of using personal care products

Chi Square test was used to determine the association between the races and practices of phthalate relating to usage of personal care products among respondent. Table 8 showed there was no association between races and practices on phthalate relating to usage of personal care products.

Table 8 Association between races and practices of using personal care products (N=320)

	Practices		x ²	p
	Frequent user	Occasional user		
Races				
Malay	36	204	1.599	0.450
Non Malay	10	70		
Total (N)	46	274		

4.5.6 Association between age and practices of using personal care products

Two statistical analyses were used to determine the association between the age and the practices of personal care products used by respondents. The first statistical test used was Spearman’s rho which used to analyze the continuous data between the age and the practices relating to usage of personal care product. Another statistical test used was Chi-Square test, where the categorical data were used to analyze it. These two data analyses indicate that there were no significant associations between the age and the practices relating to usage of personal care products among respondents. Results were shown in Table 9 and Table 10.

Table 9 Association between age and practices of using personal care products (N=320)

Socio-demographic	Knowledge	
	r	p
Age (Years)	-0.033	0.557

r value according to Spearmen’s rho

Table 10 Association between age and practices of using personal care products (N=320)

Socio-demographic	Practice		x ²	p
	Frequent user	Occasional user		
Age (Years)				
19-21	37	219	2.279	0.320
23-26	9	55		
Total (N)	46	274		

4.5.7 Association between the knowledge and practices of using personal care products (N=320)

Two types of statistical analysis were used to determine the association between the knowledge of phthalate and practices of using personal care products among respondent. First statistical test was Spearman’s rho which used to analyze the continuous data between knowledge on Phthalate and the practices relating to usage of personal care product. The statistical test used was Chi-Square test, where the categorical data were used to analyze it. These two analysis data indicate that there were no significant associations between the knowledge of phthalate and practices of using personal care products respondents. The results were shown in Figure 5 and Table 11.

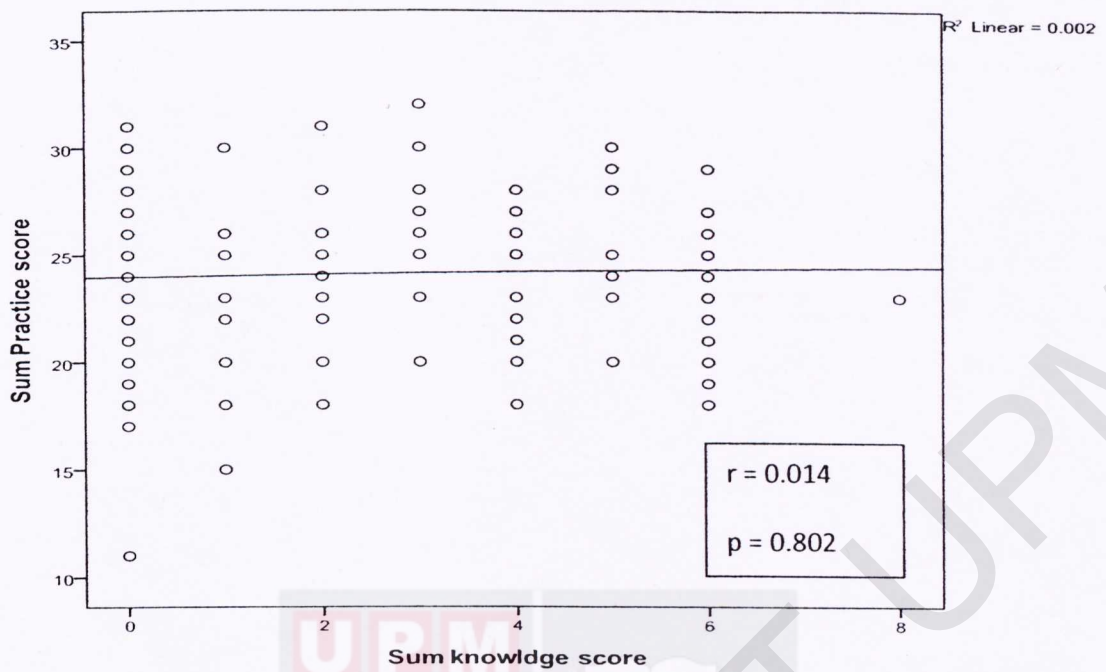


Figure 5 Association between knowledge on Phthalate and the practices of using personal care products (N=320)

Table 11 Association between knowledge on Phthalate and the practices of using personal care products (N =320)

Score	Practice		Total (N)	χ^2	p
	Frequent user	Occasional user			
Knowledge					
Fair (5-6)	8	50	58	0.930	0.628
Poor (0-4)	38	224	262		

CHAPTER 5

DISCUSSION, CONCLUSION, RECOMMENDATION

5.1 Discussion

5.1.1 Socio demographic of respondent

This study found that most respondents in this study were female with compared to the male only. Female students in secondary schools outperformed male students resulting in more female students getting a place in undergraduate studies in the institutions of higher learning (IPTA) (Idris, 2008). Based on the Bloom's Taxonomy (classification of levels of intellectual behavior important in learning), girls tend to do better academically because they have better cognitive abilities while boys have better psychomotor skills. In term of races, most respondents were Malay (bumiputera). According to racial composition, 27,829 of students in IPTA were

bumiputera, 10,116 are Chinese and the remaining 2,421 comprise the Indians and others (M. Khuzairi, 2010).

5.1.2 Comparison on knowledge of phthalate in personal care products between science based and non science based student

Science based students showed better knowledge compare to non science based student because as a science based students, they already learned in class that chemicals able to affects human health even though from this study both students from science based and non sciences based actually do not know anything about phthalate.

Most of them were identified that they never heard and do not had any ideas on what was phthalate. According to Meeker (2009), one of the problems for consumer did not know exactly which products contain phthalates because the products were not labeled accordingly. This study also supported the reason of poor knowledge among respondents regarding phthalate where The United State of Food and Drug Administration (FDA) under the authority of the Fair Packaging and Labeling Act (FPLA). FDA requires an ingredient declaration on the cosmetic products sold at the retail level to consumers, but the regulations did not require the listing of the individual fragrance ingredients. Therefore, the consumer would not be able to determine from the ingredient declaration if phthalates was present in a fragrance. Also, because the FPLA does not apply to products used exclusively by

professionals, for example, in salons the requirement for an ingredient declaration did not apply to these products (FDA, 2008).

5.1.3 Comparison of the practices and risk of phthalate exposure due to usage of personal care products between science based and non sciences based students.

The risk of phthalate exposure was reflected from frequencies of practicing the usage of personal care products by the respondents. This study showed science based students were practiced better compare to non science based student. However, both group still had the risk of phthalate exposure to them because majority of respondents score as frequent user where more than 50 % of students from both faculties also were identified usually practicing the usage of personal care products like deodorant, fragrance, hand and body lotion, body shower or soap and facial cleanser in a week.

A market survey of 252 products in Canada including baby products showed that Diethyl phthalate (DEP) is the predominant phthalate used in cosmetic and personal care products, followed by di-n-butyl phthalate (DnBP) and di(2-ethylhexyl) phthalate (DEHP). Fragrances and lotions followed by deodorants appear to be the primary source of exposure to DEP, while nail polishes are the primary source of DnBP (Diane, 2011). This situation can lead to the possibility of phthalate

accumulation in their body. For example, Diethyl phthalate was the most frequently used phthalate in cosmetic and personal care products (SCCP, 2007, Hubinger et al., 2006 & Houlihan et al., 2002) and chronic several epidemiological studies had shown an association between high phthalate exposure and their effects on the human endocrine or reproductive system (Hauser et al., 2007).

5.1.4 Association between socio-demographic with knowledge on phthalate and practices of using personal care products between science based and non science based student.

The factors that had been considered in socio-demographic information were age, gender, races and batch. This study showed that socio-demographic data of the respondents did not influence the knowledge on phthalate and practices of using personal care products.

This was the first study regarding the knowledge on phthalate and practices of using personal care products was done in Malaysia, therefore no previous study was found to support the association between the socio-demographic and knowledge.

According to Meeker (2009), one of the major problems for consumer did not know exactly which products contain phthalates because the products were not labeled accordingly. The United State of Food and Drug Administration (2008) under the authority of the Fair Packaging and Labeling Act (FPLA), FDA requires an

ingredient declaration on the cosmetic products sold at the retail level to consumers, but the regulations did not require the listing of the individual fragrance ingredients. Therefore, the consumer would not be able to determine from the ingredient declaration if phthalates was present in a fragrance.

5.1.5 Association between knowledge on phthalate and practices of using personal care products between science based and non science based student

Results were found no significant association between knowledge and practices of phthalate relating to usage of personal care products. However, a quite similar study was done by Kasemsup, (2011) which compare the knowledge and practice of plastic container between health personnel and parents showed the similar result with this study where majority of the respondent's knowledge was inadequate but able to practice the usage of plastics in appropriate ways.

5.2 Conclusion

This study evaluated the knowledge and practice of phthalate relating to usage of personal care products among UPM students. This study found that most of the students had poor knowledge on phthalate but science based students showed better understanding on phthalate as compared to non-science based students even though the differences was little. The students also showed poor knowledge on phthalate, but they were able to practice the usage of personal care products in moderate way. It may conclude that the knowledge did not influence the practice of using personal care products. In regards of knowledge and practice of phthalate relating to usage of personal care products, the research was only focused on students. For the next time research, maybe it can be expended to other group such as staff, employer, or lecturers to determine the knowledge and practice about the similar study. However, an appropriate method need to be use as there might have challenge regarding time consuming in order to obtain the information from them.

The finding of this preliminary data on knowledge of phthalate was quite alarming as majority of the respondents with higher education level do not know about phthalate in personal care products which might effects the human health. It was a good start on research relating to phthalate conducting in UPM where the result obtained could illustrated on how the knowledge and awareness of this issue to the community. It was essential to monitor phthalate exposure level of the respondents to obtain the

evidence which could relate with the practice of using personal care products in this study.

5.3 Recommendation

For the recommendation, the knowledge on environmental health should be given and raised among the students to make sure they had some knowledge on the chemicals such as phthalate that could affect human health. Besides that, when they are going to the beauty salon and nail parlors, they were advised to minimize re-exposure to phthalates by asking the usage of phthalate-free in personal care products including cosmetics and also ask for their help in convincing cosmetics companies to get phthalates out of their products.

Besides that, the FDA (Food and drug administrative) must prohibit the marketing of all cosmetics used by women of childbearing age that contain chemicals like phthalates known to cause birth defects. The FDA must follow that action with a thorough, probability based safety assessment that considers aggregate exposure to phthalates from all relevant food, drugs, medical devices, cosmetics, and consumer products, and that makes use of and is consistent with CDC bio-monitoring data.

The manufacturers also play the main role where companies should publicly pledge to voluntarily remove phthalates from their products, starting with those likely to cause the greatest exposure and those marketed to children and

women of childbearing age. They should label all phthalate-containing products on a label that can be read easily before purchase. Lastly, manufacturers should test cosmetics ingredients and final products, using a complete battery of health and safety studies equivalent to what is required for food additives, and market only those products that meet rigorous, comprehensive safety standards.



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APPENDIX 1

ETHICS APPROVAL FROM UPM ETHICAL
COMMITTEE



APPROVAL FROM ADMINISTRATIVE
MANAGEMENT



RECRUITMENTS OF RESPONDENTS



DATA COLLECTION



STATISTICAL ANALYSIS



RESULTS

APPENDIX 2

Gantt Chart

[illegible]

APPENDIX 3



Questionnaire

TITLE: KNOWLEDGE AND PRACTICES OF PHTHALATE IN RELATION TO THE USAGE OF PERSONAL CARE PRODUCTS

Information: This study is aims to determine the knowledge and practices of Phthalate relating to usage of personal care products among UPM students. Luckily, you are selected to be the respondent in this study and hopefully you can give the information correctly. All the information given is just for the research purpose only. Thanks you for your cooperation and kindness.

Respondent ID :

--	--	--

Date:

--	--	--	--	--	--	--	--	--	--

RESEARCHER: NURUL NURSUHADA BT MUSTAPHA

*For research purpose only

CONFIDENTIAL



Please tick (/) the appropriate answer and fill in the blank when necessary

Part A: Respondent's Background

1. Faculty : _____

2. Course: _____

3. Age: _____

4. Batch: a) 1st year ☐

 b) 2nd year ☐

 c) 3rd year ☐

 d) 4th year ☐

5. Gender : a) Male ☐

 b) Female ☐

6. Races a) Malay ☐

 b) Chinese ☐

 c) Indian ☐

 d) Others ☐

 Please specify : _____



Please tick (/) the appropriate answer and fill in the blank when necessary

Part B: General knowledge

1. Do you use any personal care or cosmetic products in your daily life?

a) No ☐

b) Yes ☐

If yes, please state the products that you use below:

i) _____

ii) _____

iii) _____

iv) _____

v) _____

vi) _____

vii) _____

viii) _____

xi) _____

x) _____

Please tick (/) the appropriate answer and fill in the blank when necessary

2. Do you use any products from the list below?

Code / Products	No	Yes
(B1) Deodorant		
(B2) Fragrance		
(B3) Hair gel		
(B4) Hair mousse		
(B5) Hair spray		
(B6) Hand and body lotions		
(B7) Body shower/soap		
(B8) Nail polish		

3. Do you have any idea on what is Phthalate is?

No ☐

Yes ☐

If yes, please indicate the sources of your information: _____

4. Do you have any knowledge on any products contain Phthalate?

No ☐

Yes ☐

If yes, please state the products do you know may contain Phthalate:

5. Do you know Phthalate can be harmful to human health?

No ☐

Yes ☐

If yes, please state the harmful effects do you know:

Please tick (/) the appropriate answer

6. Based on your knowledge, which health effects listed below is related to use of products contain Phthalate?

Health Effects	No	Yes
a) Early onset of puberty		
b) Interfering with the male reproductive tract development		
c) Interfering with the natural functioning of the hormone system		
d) Causing reproductive and genital defects		
e) Lower testosterone levels in adolescent males		
f) Lower sperm count in adult males		



7. Do you will minimize the use of products contain phthalate if you know that the phthalate can cause harmful effects to human health?

No

☐

Yes

☐

8. Do you will recommend others to minimize the using of products contain phthalate if you know that the phthalate can cause harmful effects to human health?

No

☐

Yes

☐

Please tick (/) the appropriate answer

Part C: Practices Of using Personal care and Cosmetic products

	Personal care /Cosmetic product	Frequencies Of use per week			
Code	Products contain Phthalate	Usually (5-7 days/wk)	Sometimes (3-4 days/wk)	Occasionally (1-2 days/wk)	Never
C1	Deodorant				
C2	Fragrance				
C3	Hair gel				
C4	Hair spray				
C5	Hand and body lotions				
C6	nail polish				
C7	shampoo				
C8	Body shower/soap				
C9	Facial Cleanser				

Do you interested to know the finding of this study?

No ☐

Yes ☐

If yes, please indicate your phone number and email address

Phone number: _____

Email address: _____

~The end~

-Thank you for your cooperation-

Have a nice day

APPENDIX 4

APPENDIX 5

RESPONDENT'S INFORMATION: Please read the following information carefully, do not hesitate to discuss any questions you may have with your researcher.

**STUDY TITLE : KNOWLEDGE AND PRACTICES OF PHTHALATE
IN RELATION TO THE USAGE OF PERSONAL CARE PRODUCTS**

Researcher: Nurul Nursuhada Bt Mustapha

INTRODUCTION :

Phthalates are esters of phthalic acid and a family of chemicals that have a wide range of applications in consumer goods, including children's toys, building materials, food packaging, cosmetics, personal care products, cleaning materials, pharmaceuticals and medical devices. U.S Environmental Protection Agency was estimated that globally, over 470 million pounds of phthalates are produced every year. Phthalates are a concern in environmental public health because of the high potential for human exposure to phthalates and they demonstrated toxicity in animals. Due to the all of the issues stated about phthalate and lack of research regarding on this topic conducting in Malaysia, therefore this study is hopefully able to provide information and giving concern on the knowledge and practices of respondents regarding the health issues on phthalate .

WHAT WILL YOU HAVE TO DO?

You need to sign the respondent consent form that show you are interested in this study. It can be done after you are finished read and understanding the contain of this sheet. This form need to be returned to the researcher before the test is conducted.

WHAT WILL BE BENEFITS OF THE STUDY:

(a) TO YOU AS THE SUBJECT?

The benefits for the subject is he/she able to get more knowledge regarding the issues and this will helping them in order to create more awareness regarding the health and environment

b) TO THE INVESTIGATOR?

This research will give a chance to the researcher to share knowledge and create awareness regarding the issues of human health and environment

ARE THERE ANY RISKS?

There is no risk that can effect the subject if they join the research

WILL THE INFORMATION AND MY IDENTITY REMAIN CONFIDENTIAL?

All the information and respondent's identity is remain confidential.

WHO SHOULD I CONTACT IF I HAVE ADDITIONAL QUESTIONS DURING THE COURSE OF THE RESEARCH?

If you need more information and have any problems you can contact the researcher and the researcher will help you .

Thanks you for your cooperation and kindness.

Nurul Nursuhada Bt Mustapha,
Researcher,
B. Sc. Environmental and Occupational Health,
Environmental and Occupational Health Unit,
Community Health Department,
Medicine and Health Sciences Faculty,
University Putra Malaysia.
013-6713911
nurul_eman88@yahoo.com.my

APPENDIX 6



BORANG PERSETUJUAN RESPONDEN

**TAJUK KAJIAN: KNOWLEDGE AND PRACTICES OF PHTHALATE
IN RELATION TO THE USAGE OF PERSONAL CARE PRODUCTS**

PENYELIDIK : NURUL NURSUHADA BINTI MUSTAPHA

Saya No.K/P:
alamat.....

.....dengan ini secara sukarela bersetuju untuk
mengambil bahagian dalam penyelidikan yang dinyatakan di atas. Saya telah dimaklumkan mengenai
latar belakang penyelidikan ini dari segi kaedah, kemungkinan kesan buruk dan komplikasi(rujuk
kepada risalah maklumat). Saya faham bahawa saya mempunyai hak untuk menarik diri dari kajian ini
pada bila-bila masa tanpa memberikan apa jua sebab. Saya juga faham bahawa kajian ini adalah sulit
dan semua maklumat yang diberikan mengenai identiti saya adalah sulit dan persendirian.

Saya ingin *tahu/tidak ingin mengetahui keputusan ujian yang dijalankan ke atas sampel saya.

* potong mana yang tidak berkaitan

Tandatangan
(Responden)

Tandatangan.....
(Saksi)

Tarikh :.....

Nama :.....

No. K/P:.....

Saya mengesahkan bahawa saya telah menjelaskan kepada responden latar belakang dan tujuan
penyelidikan di atas.

Tarikh

Tandatangan.....
(Penyelidik)