

ABSTRACT

Maternal cigarettes smoking have many negative effects on both the mother and fetus during pregnancy. Discontinuation of smoking can have many long-term benefits for both. There are special programs available to pregnant women and those thinking about conceiving to help quit smoking. Our study was done to highlight the association between tobacco smoke exposure of pregnant mothers and blood pressure of their newborns.

Our study is a prospective cohort review included 200 neonates. The neonates were divided into two groups: The first group represented the non smokers and they were 100 neonates, whereas the second group represented the smokers and they were 100 neonates. The later group was further subdivided into two subgroups, passive smokers and active smokers. The active smokers were categorized according to the number of cigarettes smoke into three groups. We found a statistically significant difference (P value 0.001) in neonatal systolic and diastolic blood pressure between smoking group and non smoking group. We also revealed significant correlation between the number of cigarettes smoke and neonatal blood pressure i.e. the greater the number of cigarettes smoke the higher the systolic and diastolic blood pressure of neonates. We also revealed the effect of smoking on neonatal anthropometric measurements. Birth weight of neonates of smoking group was statistically significantly lighter (P value 0.001). than those of non smoker mothers. Neonatal head circumference of smoking group were slightly reduced than those of non smoking group, although not statistically significant. (P value 0.029). Neonatal length of smoking group was statistically significantly shorter at birth than those of non smoking group (P value 0.001).

Conclusion: *We concluded that Smoking during pregnancy has substantial effect on neonatal systolic and diastolic blood pressure. We also revealed that smoking during pregnancy affected neonatal anthropometric measurements. (Birth weight, length, and head circumference).*

Keywords: *maternal smoking, neonatal hypertension, tobacco.*

CONTENTS

<i>contents</i>	<i>Page</i>
List of tables.	I
List of figures.	II
List of abbreviations.	III -IV
Introduction and aim of work.	1-3
Review of Literature	
Chapter 1: The effect of smoking.	4-20
Chapter 2: Neonatal hypertension.	21-41
Chapter 3: prevention of smoking.	42-47
Subjects and Methods.	48-49
Results.	50-60
Discussion.	61-67
Conclusion and Recommendations.	68
Summary.	69-70
References.	71-82
Arabic summary.	

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LIST OF ABBREVIATIONS

ADD	Attention Deficit Disorder
BP	Blood Pressure
BBR	Brain: Body Weight Ratio
BPD	Broncho Pulmonary Dysplasia
COHb	CarbOxyHaemoglobin
CoA	Coarctation Of the thoracic Aorta
CT	Computed Tomography
CAH	Congenital Adrenal Hyperplasia
CHF	Congestive Heart Failure
DPG	Diphosphoglycerate
EPA	Environmental Protection Agency
ETS	Environmental Tobacco Smoke
FMD	Fibromuscular Dysplasia
GHQ	General Health Questionnaire
HDL	High Density Lipoprotein
IVF	In Vitro Fertilization
I.Q	Intelligent Quotient
ICU	Intensive Care Unit
IVH	Intra Ventricular Hemorrhage
LVH	Left Ventricular Hypertrophy

MRA	Magnetic Resonance Angiography
MRI	Magnetic Resonance Imaging
MAP	Mean Arterial blood Pressure
NICU	Neonatal Intensive Care Unit
PDA	Patent Ductus Arteriosus
PRA	Plasma Renin Activity
PKD	Polycystic Kidney Disease
PRAMS	Pregnancy Risk Assessment Monitoring System
RVT	Renal Vein Thrombosis
RAS	Renin-Angiotensin System
SIDS	Sudden Infant Death Syndrome
SMBR	Swedish Medical Birth Register
TOLD	Test of Language Development
TPN	Total Parenteral Nutrition
US	Ultrasonography
VSD	Ventricular Septal Defect
WISC-R	Wechsler Intelligence Scale for Children-Revised
WHISTLER	Wheezing Illnesses Study Leidsche Rijn Birth Cohort
WRAT-R	Wide Range Achievement Test Revised

LIST OF FIGURES

Number of figure	Title	Page
1	Prevalence of smoking during the last three months of pregnancy by demographic characteristics.	6
2	Prevalence of smoking during the last three months of pregnancy by access to health care.	7
3	Evaluation of neonatal hypertension.	40
4	Pattern of smoking in our studied groups.	53
5	Sex distribution in our studied group.	53
6	Mean gestational age in smoking & non smoking group.	54
7	Mean Systolic Blood Pressure in smoking & non smoking group.	55
8	Mean Diastolic Blood Pressure in smoking & non smoking group.	55
9	Blood Pressure variation in our studied groups.	56
10	Systolic Hypertension in smoking group.	56
11	Systolic Blood Pressure according to the smoking pattern.	57
12	Diastolic Blood Pressure according to the smoking pattern.	57
13	Type of Hypertension in smoking group.	58
14	Mean Birth Weight in our studied groups.	58
15	Mean length in our studied groups.	59

LIST OF TABLES

Number of tables	Title	Page
1	Analysis of blood pressure according to the gestational age.	26
2	Analysis of blood pressure of group I "full term infants ≥ 37 week" according to day of life.	26
3	Analysis of blood pressure of group II A "preterm infants 28-32 week" according to day of life.	27
4	Analysis of blood pressure of group II B "preterm infants 33-36 week" according to day of life.	27
5	Clinical evaluation of confirmed hypertension.	41
6	Mean values of different parameters in group B (smoking group) & group A (non smoking group)	54
7	Mean values of different parameters in group B (smoking group)	60

Aim of work

The aim of this study is to assess the positive correlation between the number of cigarettes smoking by the mothers during pregnancy and the blood pressure of their offspring. We also aim to explore the effects of smoking during pregnancy on neonatal anthropometric measurements (length, head circumference and birth weight).

The Effect of Smoking

General background

Smoking is a major public health problem. All smokers face an increased risk of lung cancer, other lung diseases, and cardiovascular and other disorders. Smoking during pregnancy can harm the health of both the woman and her unborn baby. Despite the fact that generally the number of smokers has declined, the number of heavy smokers has practically doubled in the last 10 years and more so in women than in men. This statistic is of particular interest because it has been proven that the more cigarettes a woman smokes throughout her pregnancy, the more the unborn child will be affected or harmed. Not only could the correct development of the baby's body be at risk, but so could the development of its brain and its health. These problems could have a lifetime impact on the child, possibly staying with him well into adulthood (*Martin et al., 2006*). Smoking makes it harder to conceive, irrespective of which partner smokes. Both female and male smokers have lower fertility levels, while adults who were born to mothers who smoked have less chance of becoming a parent themselves. Smoking also reduces the chance of In Vitro Fertilization (IVF) succeeding. It's thought that nicotine reduces a woman's fertility by affecting the production of hormones that are necessary for pregnancy. Smoking also impedes the transportation of the egg through the fallopian tube to the womb. Male smokers tend to have a sperm count that is 15% lower than that of non-smokers (*Philip, 1994*). Cigarette smoke contains 2000 components, some of the most harmful for pregnant women and their babies is thought to be nicotine, carbon monoxide and cyanide. These substances have been found to cross the placenta and reach the baby (*Palmer, 2000*).

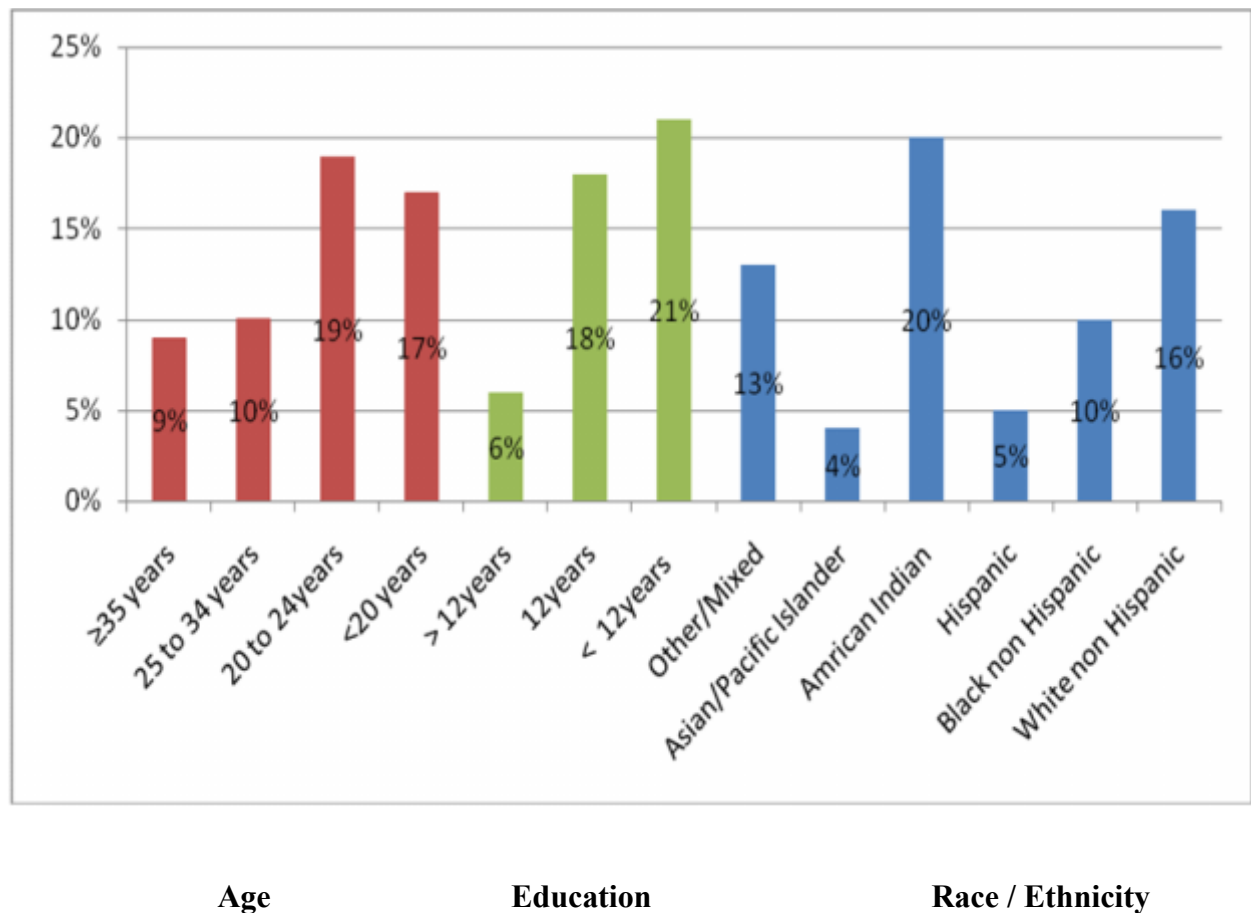
The smoking habits of a group of pregnant women have been related to the level of CarbOxyHaemoglobin (COHb) in the circulating blood. Simultaneous maternal and fetal (COHb) levels at delivery were estimated and on average the fetal levels were 1.8 times greater than the related maternal level. Samples of fetal blood exposed to carbon monoxide in vitro and an appreciable shift to the left of the haemoglobin dissociation curve was demonstrated. Cigarette smoking during pregnancy diminishes the oxygen carrying capacity of both fetal and maternal blood, affects maternal oxygenation by increased pulmonary venous admixture and diminishes the oxygen available to the fetus at the tissue level by its effect on fetal oxyhaemoglobin dissociation (*Cole et al., 1972*).

Prevalence of smoking

Most published research on smoking during pregnancy comes from developed countries (*WHO, 1994*). In the United States and in other industrialized countries, 18% of women smoke (*CDC, 2007*). Currently, at least 10% of women in the United States smoke during pregnancy (*Martin et al., 2006*). This proportion is somewhat smaller in developing countries where only 8% of women smoke (*WHO, 2001*).

According to Pregnancy Risk Assessment Monitoring System (PRAMS, 2004) data from 26 states demonstrated prevalence of smoking during the last 3 months of pregnancy as follow : (*CDC, 2007*)

- i.** Approximately 13% of women reported smoking during the last 3 months of pregnancy.
- ii.** Younger, less educated, non-Hispanic white and American Indian women are more likely to smoke during pregnancy compared with their older, more educated counterparts. **Figure (1).**



Figure(1):Prevalence of smoking during the last three months of pregnancy by demographic characteristics (*CDC,2007*).

iii. Women on Medicaid are more than three times as likely to smoke during the last 3 months of pregnancy as women with private insurance, and smoking rates are higher among women who enter into prenatal care later in pregnancy. **Figure (2).**

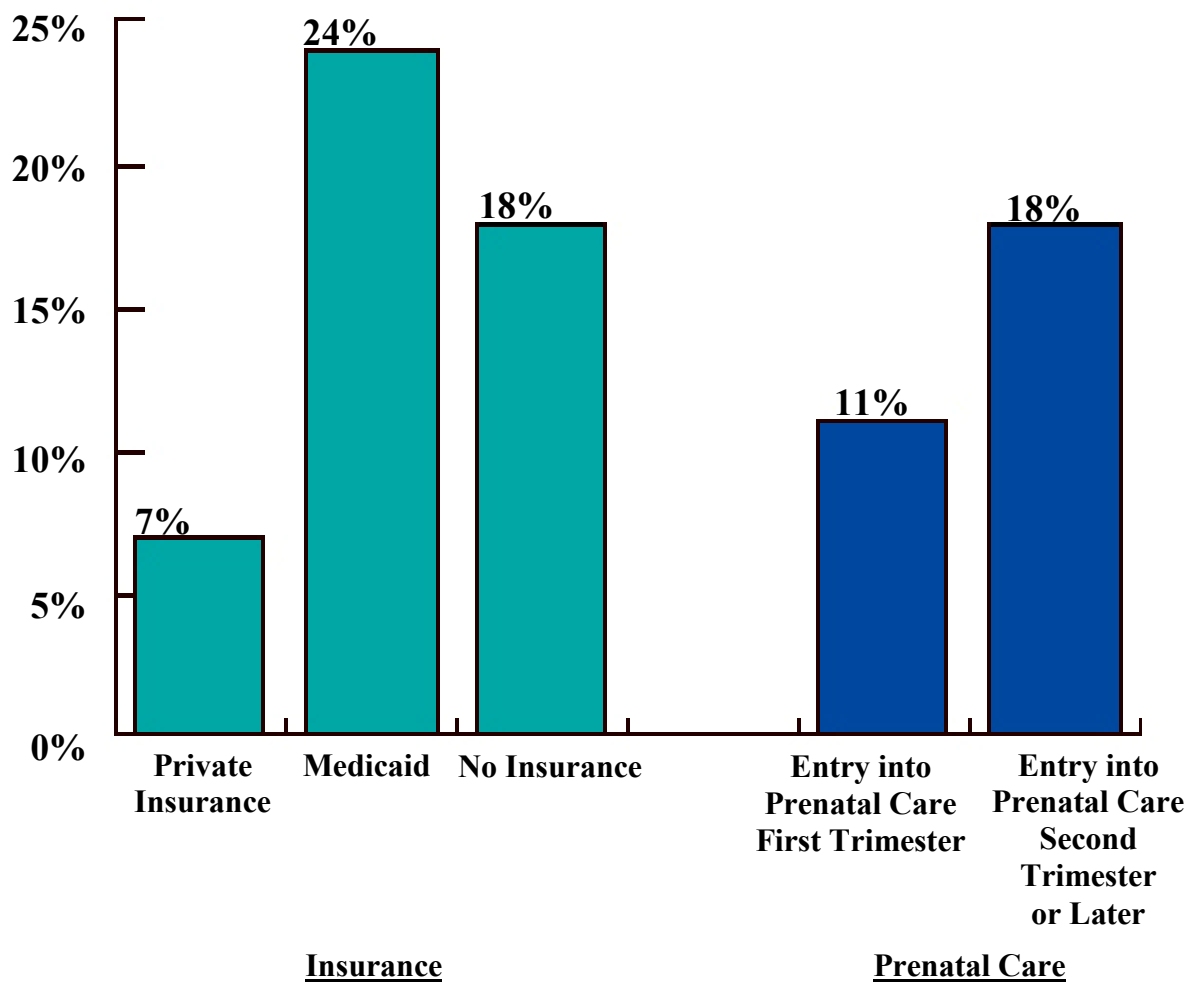


Figure (2): Prevalence of smoking during the last three months of pregnancy by access to health care (CDC, 2007).

iv. Of women who smoked 3 months before pregnancy, 45% quit during pregnancy. Among quitters during pregnancy, 52% relapsed within 6 months after delivery (CDC, 2007).

A cross-sectional study was done in Lebanon in 2003 to assess the prevalence of smoking prior to and during pregnancy using two structured instruments. One instrument included information on demographic characteristics, smoking patterns in pregnancy and previous pregnancies, use of prenatal health services, stressful life events, and social support during pregnancy.

The second was the Arabic General Health Questionnaire (GHQ). Women who delivered in 11 randomly selected hospitals in Beirut and its suburbs within 24 hours were asked to consent to participate in the study. The total sample interviewed was 576 women. (*Monique et al., 2003*).

The prevalence of pre-pregnancy smoking amongst women in the different hospitals studied and among geographic areas was comparable. Of the women studied 28% were pre-pregnant smokers. However, there were statistical differences in smoking during pregnancy among women who delivered in Beirut versus those in the suburbs. 19 % of women in Beirut and 21 % of those in the suburbs smoked cigarettes after they knew they were pregnant (*Lumley et al., 2000*). Pre-pregnancy smoking was associated with older maternal age, low and medium education, increased psychiatric distress and a husband who smoked. Continued smoking during pregnancy was associated with low and medium education, younger age and a heavy pre-pregnancy smoking pattern. Overall, 63% of smokers continued to smoke throughout their pregnancy, while 37% made attempts to quit smoking (*O'Campo et al., 1992*). The most commonly cited reason for failing to quit was: “addiction, difficulty to break the habit, no will.” The second most frequent reason reported was the relaxing effect of the cigarette. 10 % of persistent women smokers increased their smoking frequency, 40% maintained the same smoking pattern, and 50% reduced it. One very young woman began to smoke during pregnancy. The mean age of onset of smoking was 18 years, with women having had started as early as 11 years of age. The mean duration of smoking among the sample was 10 years $\pm$ 5 years (*Monique et al., 2003*).

The developed world has lately experienced a tangible decrease in the overall smoking prevalence as a result of multiple preventive measures. These include workplace or community smoking bans, statewide taxes on tobacco, and anti-smoking media campaigns, in addition to individual cessation strategies.

By contrast, the smoking prevalence in Lebanon and other developing countries has shown a steady rise over the past several years. Such rise may be partially due to a growing social acceptability to various types of tobacco smoking namely cigarettes and argileh (*Ebrahim et al., 2000*).

Secondhand smoke

According to (*American Lung Association, 2008*). Secondhand smoke, also known as environmental tobacco smoke (ETS), or passive smoke is a mixture of the smoke given off by the burning end of a cigarette, pipe or cigar and the smoke exhaled from the lungs of smokers. It is involuntarily inhaled by nonsmokers, lingers in the air hours after cigarettes have been extinguished and can cause or exacerbate a wide range of adverse health effects, including cancer, respiratory infections, and asthma (*California Environmental Protection Agency, 2005*). Secondhand smoke has been classified by the Environmental Protection Agency (EPA) as a known cause of cancer in humans (Group A carcinogen). When a person lights up a cigarette, the non smoker breathes smoke from the burning tip of the cigarette and "mainstream" smoke that has been inhaled and then exhaled by the smoker. "Side stream" smoke contains more than 4000 chemicals, including tar and carbon monoxide and 69 known carcinogens (cancer-causing substances) such as formaldehyde, lead, arsenic, benzene, and radioactive polonium 210. Several carcinogens have been shown to be present at higher concentrations in sidestream smoke than in mainstream smoke, in part because passive smokers do not gain the benefit of the filter (*Meleigy, 2007*).

According to PRAMS, 2004 between 1988 and 2002, cotinine levels, a biological indicator of tobacco smoke exposure, declined by approximately 70% among children and non-smoking adults. Despite this positive trend, in 2002 nearly half of all children and non-smoking adults still had detectable levels of cotinine.