

Substance Abuse During Pregnancy

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Substance use among adolescents may range from experimentation to chronic, heavy use of single or multiple substances. The risk-taking behaviors of early sexual activity and substance use have been linked¹ and pregnancy and substance use or abuse may occur simultaneously, particularly in early gestation when the adolescent may be unaware of her pregnancy.

PREVALENCE

Among 12th grade females recently surveyed:²

- 19% smoked cigarettes on at least 20 days of the previous month.
 - 82% had tried alcohol.
 - 34% drank five or more alcoholic drinks on at least one occasion (binge drank) on one or more days during the previous month.
 - 22% used marijuana one or more times during the previous month.
 - 8% had ever used any form of cocaine.
 - 16% had ever used drugs other than marijuana or cocaine (e.g., LSD, PCP, ecstasy, mushrooms, speed, heroin).
 - 10% had ever used inhalants to get high.
- Teenage smokers account for 85-90% of all new female smokers.³

- Cigar smoking is also increasing among adolescent females.⁴
- Estimates of substance use among pregnant adolescents range from 11% to 55%. These are rates similar to those for nonpregnant adolescent females.⁵
- In one study of pregnant adolescents, 25% used tobacco, alcohol and marijuana six months before conception and 49% used at least one substance during pregnancy.⁵
- Tobacco and alcohol are the most commonly used drugs in adolescent pregnancy; their use is highly correlated with that of family members and partner.⁵
- While some studies show that pregnant adolescents decrease tobacco and alcohol use, others show an increase in smoking and heavy drinking rates.^{5, 6}

ASSOCIATED RISKS

The adverse effects of substance use during pregnancy are determined primarily by:

- **Timing.** Substance use adversely affects pregnancy outcome at all stages of gestation.⁷ During embryonic development (first eight weeks), organ damage and congenital malformations can occur. From the third month until term, central nervous system damage,

behavioral abnormalities and growth retardation can result.⁸

- **Dosage.** The degree of risk is related to the amount and frequency of the substance used. Regular, heavy exposure and binge use are especially damaging.
- **Duration.** Substance use throughout pregnancy is associated with the greatest risk.
- **Number of substances.** Use of two or more drugs or the combination of drugs, alcohol and/or tobacco compounds their effects. For example, the risk of low birthweight is nearly doubled with combined alcohol and tobacco use, compared with use of either substance alone.⁹
- **Environment.** Factors such as poor nutrition or health status may intensify the adverse effects of substances.⁷
- **Individual susceptibility.** Genetic make-up may predispose some individuals to greater risk from substance use.⁷

Substance use/abuse may be a significant factor in perinatal mortality and morbidity in adolescent pregnancy. Effects may include:

- Increased health problems, including risk of AIDS
- Compromised nutritional status and inadequate weight gain
- Higher rates of obstetrical complications
- Psychosocial, economic and legal problems
- Parenting difficulties
- Higher rates of child abuse and neglect

Perinatal risks associated with substance use during pregnancy and longer term effects during infancy and childhood are summarized in Table 1. Although there is a lack of research on the effects of substance use on adolescent pregnancy outcome, the risks are likely to be comparable, and may be more pronounced than those in adult pregnant women.

Alcohol

Alcohol rapidly crosses the placenta and distributes in maternal and fetal blood at comparable levels of concentration. Low fetal levels of alcohol dehydrogenase, the enzyme system that metabolizes alcohol, result in prolonged exposure and increased vulnerability to its effects. Alcohol and its metabolites are known teratogens

with direct, toxic effects on fetal and placental cellular growth.¹⁰ Alcohol also has adverse effects on the adolescent's health and nutritional status.

- Alcohol's effects on perinatal mortality, infant birthweight and congenital malformations are dose-dependent, with binge drinking most damaging. However, as little as 1 drink per day can have adverse neonatal outcomes.^{10, 11} (1 drink = 0.5 oz absolute alcohol: 12 oz beer; 10 oz wine cooler; 4 oz wine or 1 oz liquor)
- Alcohol decreases DNA synthesis and impairs cellular growth and differentiation.¹⁰
- Normal placental function is impaired with alcohol use resulting in decreased glucose and amino acid transfer to the fetus.¹⁰
- The risk of spontaneous abortion is increased two-fold in moderate drinkers (more than 1 oz of alcohol twice per week) and four-fold with heavy alcohol use (at least 2 drinks per day or an average of one drink a day with periodic intake of 5-6 drinks per occasions).¹⁰
- Stillbirths, prematurity, placental abruption (premature detachment of the placenta) and prenatal and postnatal growth retardation have been observed with perinatal alcohol exposure.¹⁰
- Low birthweight can be induced with 1 oz of alcohol (2 standard drinks) per day.¹⁰
- Binge drinking early in pregnancy may be associated with neural tube defects, while chronic, heavy use may result in craniofacial abnormalities or cardiac, hepatic, musculoskeletal or genitourinary anomalies.¹⁰
- Irritability, hyperactivity, sleep disturbances, delayed fine motor development, poor judgment, learning disorders, attention deficit disorder and feeding difficulties may occur as a result of fetal alcohol exposure.¹²
- Mild to moderate mental retardation can occur in infants of chronic, heavy alcohol users.¹⁰
- Fetal alcohol syndrome (FAS), a combination of physical and mental birth defects, can occur with consumption of 2 or more oz of alcohol per day during the first trimester.¹⁰ The diagnostic criteria for FAS are listed in Table 2. At least one abnormality from each category must be present.^{10, 13}

TABLE 1
Risks Associated with Substance Use in Pregnancy

SUBSTANCE	PERINATAL	INFANCY/CHILDHOOD
Alcohol	Placental abruption Spontaneous abortion Stillbirth Prematurity Intrauterine growth retardation Congenital malformations	Failure to thrive Neurobehavioral abnormalities Mental retardation
Caffeine	Spontaneous abortion Lowered infant birthweight	
Cocaine	Placental abruption Spontaneous abortion Stillbirth Prematurity Precipitous delivery Intrauterine growth retardation Congenital anomalies Fetal/newborn distress Cerebral infarctions	Neurological abnormalities Sudden infant death syndrome Seizures Tremulousness Irritability Feeding difficulties
Heroin	Pregnancy-induced hypertension Constipation Placental abruption Spontaneous abortion Stillbirth Intrauterine growth retardation Prematurity Neonatal death Intracranial hemorrhage	Sudden infant death syndrome Seizures Irritability Poor consolability Feeding difficulties Vomiting Diarrhea Sweating
Inhalants	Congenital anomalies Central nervous system abnormalities	Mental retardation Growth impairment
Marijuana	Placental abruption Prematurity Intrauterine growth retardation Abnormal labor	Neurobehavioral changes
Tobacco	Prematurity Placenta previa Premature rupture of membranes Placental abruption Spontaneous abortion Stillbirth Intrauterine growth retardation Congenital malformations	Sudden infant death syndrome Growth deficits Impaired intellectual development Respiratory illness Attention deficit disorder

TABLE 2

Fetal Alcohol Syndrome Diagnostic Criteria

Prenatal/Postnatal Growth Deficiency	Weight, length, and/or head circumference below the 10th percentile, NCHS growth standards
Central Nervous System Dysfunction	Neurologic or behavioral abnormalities Developmental delay Mental retardation
Facial Dysmorphology (at least two of these)	Microcephaly Small eyes Short palpebral fissures (eye openings) Epicanthus (vertical fold of skin on side of the nose, covering part of eye opening) Strabismus (crossed eyes) Flat maxillary area Short, upturned nose Underdeveloped philtrum (groove between nose and upper lip) Thin upper lip Large, low-set ears which are rotated back Receding chin

Sources: Pietrantonio M, Knuppel RA. Alcohol use in pregnancy. *Clin Perinatol* 1991;18(1):93-111; Marion IJ, Mitchell JL, Center for Substance Abuse Treatment. Pregnant, substance-using women. Rockville, MD: U.S. Dept. of Health and Human Services Public Health Service Substance Abuse and Mental Health Services Administration Center for Substance Abuse Treatment, 1993.

- Alcohol-related birth defects (ARBD) are abnormalities that do not meet all of the diagnostic criteria for FAS. They are the result of alcohol exposure in varying amounts at different stages of gestation.¹⁰
- Heavier drinkers have been observed to recognize their pregnancies later than lighter drinkers.⁶ Adolescents may be at a higher risk for fetal alcohol damage because of heavy, intermittent alcohol use, continuing later into their pregnancies.⁶
- Since there is no known safe level of alcohol consumption during pregnancy, abstinence is the best preventive measure.¹⁰

Caffeine

Caffeine is a potent central nervous system stimulant that is transferred to the fetus. Slower clearance from the maternal system during later pregnancy and inability of the fetus to metabolize caffeine increase fetal exposure to the drug.¹⁴ Adolescents may obtain appreciable amounts of caffeine through consumption of soft drinks and coffee or tea beverages (see Table 3).

- Caffeine appears to have a dose dependent effect on infant birthweight, independent of maternal energy intake, weight gain or cigarette smoking.¹⁵
- Caffeine intakes of 300 mg or more per day have been associated with reductions in birthweight that may be especially significant for premature or small for gestational age infants.¹⁶
- Caffeine intake of over 300 mg/day may be weakly associated with an increased risk of spontaneous abortion.¹⁷
- Caffeine intakes of 400 mg or more per day in women who smoked 6-10 cigarettes per day have been associated with a three-fold increased risk of prematurity.¹⁸

Cocaine

Cocaine, particularly in the more accessible and pure form of crack, is an extremely potent and addicting drug which readily crosses the placenta. A central nervous system stimulant, cocaine raises norepinephrine levels with effects including vasoconstriction, hypertension and tachycardia.¹⁹ Cocaine is metabolized more slowly during pregnancy and fetal exposure to the drug is further increased by low levels of the enzyme that metabolizes it.²⁰

- Cocaine causes maternal and fetal vasoconstriction, tachycardia and uterine contractions. Associated fetal outcomes include reduced oxygen and nutrient supply leading to intrauterine growth retardation, microcephaly, structural skeletal, cardiac or genitourinary anomalies, placental abruption or still-birth.^{21, 22}
- Sudden onset of labor, precipitous delivery and prematurity can result from uterine contractions.²¹

- Cocaine-induced neurotoxicity is associated with newborn and infant neurobehavioral abnormalities including impaired motor skills, feeding difficulties, rigid posture and poor consolability.^{21, 23}

TABLE 3
Caffeine Content of Beverages

	mg caffeine
Coffee – 8 oz	
brewed	135
instant	95
decaffeinated	5
cappuccino-instant	30-60
flavored instant	55-90
Tea – 8 oz	
black-leaf or bag	50
instant	15
green	30
Iced tea – 16 oz bottle	
Snapple	48
Arizona	5-30
Lipton	18-40
Nestea	34
Iced tea mix – 8 oz	15-45
Soft drinks – 12 oz	
Jolt	71
Sugar free Mr. Pibb	59
Josta	58
Mountain Dew	55
Kick Citrus	54
Mello Yello	53
Surge	51
Diet Coke	47
Coca -Cola	45
Dr. Pepper	41
Sunkist Orange	40
Pepsi-Cola	37
Barqs Root Beer	23
Caffeinated Waters – 17 oz	
Java Water	125
Krank	100

Sources: National Coffee Association, Tea Council of the USA, National Soft Drink Association.

Marijuana

Marijuana is the most commonly used illicit drug in pregnancy and is often used in combination with alcohol and tobacco.²⁴ Tetrahydrocannabinol (THC), the primary psychoactive component of marijuana, is highly lipid soluble and accumulates in fatty tissues, the brain, pulmonary surfactant and breast milk.²⁵

- Chronic maternal use can result in prolonged fetal exposure.²⁵
- The high carbon monoxide levels and constricted uterine blood flow produced by THC may result in reduced oxygen and nutrient supply to the fetus.²⁶
- Some studies have found associations with THC use and pregnancy course and outcome, including:^{24, 25}
 - Premature, precipitous or prolonged labor
 - Placental abruption
 - Meconium-stained fluid
 - Intrauterine growth retardation
 - Shortened gestation
 - Inadequate prenatal care
 - Lower gestational weight gain
 - Neonatal neurobehavioral effects (e.g., increase in startles, tremors, hyperflexia, sleep disturbances)

Tobacco

Tobacco is the most commonly used substance in pregnancy. The vasoconstrictive effect of nicotine and hypoxemic effect of carbon monoxide associated with cigarette smoking decrease placental transfer of oxygen and nutrients to the fetus.²⁷ In addition, smoking-induced placental changes cause a loss in placental exchange area.²⁷

- Cigarette smoking is an independent risk factor for adverse pregnancy outcomes at all stages of gestation.^{3, 25}
- While the risk for pregnancy complications increases with the number of cigarettes smoked, adverse effects on fetal development and well-being can occur from smoking as few as 5 cigarettes per day.⁴
- The risk for spontaneous abortion, perinatal loss (fetal intrauterine death after 20 weeks) and neonatal death (occurring in first 28 days of life) is 33% higher in smokers compared to nonsmokers.³

- Higher rates of placenta previa, placental abruption and premature rupture of membranes are associated with increased perinatal loss in smokers.^{3, 27}
- Risk of congenital anomalies (e.g., cleft lip, cleft palate and heart defects) is higher.²⁵

Cigarette smoking effects both fetal growth and gestational age and is the largest modifiable risk factor for intrauterine growth retardation and prematurity in the U.S., accounting for 20-30% of low birthweight.³

- Smoking even one low-nicotine cigarette per day reduces birthweight by 2% each day.²⁵
- An average 200-gram decrease in infant birthweight persists after controlling for age, parity, energy intake, alcohol use, socioeconomic status and education.²⁷
- Smokers have a 3.5 to 4.0-fold increase in small-for-gestational-age infants compared to nonsmokers^{27, 28}
- Rates of low birthweight (<2500 grams) are nearly doubled in smokers compared to nonsmokers.²⁹
- Obesity prior to pregnancy or additional gestational weight gain doesn't protect against the reduction in birthweight associated with cigarette smoking.^{30, 31}
- Reduction in birthweight can be prevented by quitting smoking before the third trimester.²⁵
- Regular exposure to passive cigarette smoke has an effect similar to light smoking on infant birthweight.³
- Smokeless tobacco also decreases infant birthweight.³

NUTRITION-RELATED CONCERNS

In addition to direct, adverse perinatal effects of substance use, effects on nutrition status may further complicate pregnancy outcome (see Table 4).

- Appetite suppression associated with chronic, heavy substance use reduces the quantity, quality and frequency of food intake. Cocaine is a particularly powerful anorectic.
- Alcohol, containing 7 kcal/g, may displace nutrient-containing energy sources in the diet. For example, one pint of 86 proof alcoholic beverage provides

TABLE 4
Potential Effects of Substance
Use on Nutrition Status

Appetite suppression
 Reduced nutrient intake
 Decreased nutrient bioavailability
 Increased nutrient losses/malabsorption
 Altered nutrient synthesis, activation and utilization
 Impaired nutrient metabolism and absorption
 Increased nutrient destruction
 Higher metabolic requirements of nutrients
 Inadequate weight gain/weight loss
 Iron deficiency anemia
 Decreased financial resources for food

approximately 1000 non-nutritive calories, nearly one-half of the mean recommended intake for a pregnant adolescent.

- At chronic, heavy levels of intake, alcohol is metabolized by an alternate pathway, which reduces its energy bioavailability. Nutritional deficiencies of protein, fat, zinc, calcium, iron, and vitamins A, C, B₆, B₁₂, thiamin, and folate may also occur.^{13, 32}
- Nausea, vomiting, diarrhea or increased nutrient losses may occur with chronic or heavy alcohol use.
- Low gestational weight gain has been observed in smokers, despite an adequate energy intake. Cigarette smoking may increase metabolic rate and decrease energy availability. If the adolescent quits smoking, she may experience excessive weight gain.³¹
- Smoking also appears to increase iron requirements and decrease the availability of vitamins B₁₂ and C, folate, calcium, zinc and amino acids.^{13, 25}
- Severe constipation can occur with opiate or methadone use.³³
- High intakes of caffeine may decrease the absorption and/or increase urinary losses of thiamin, zinc, iron and calcium.³⁴

ASSESSMENT

Determination of substance use to identify those in need of further assessment and intervention is an essential component of the obstetrical care of all adolescents. Substance use/abuse patterns should be assessed as early as possible in pregnancy so that intervention can be initiated and adverse effects on the developing fetus reduced. The information is best obtained by personal interview in a direct, nonjudgmental and caring manner. An explanation of the purpose of the interview will help to elicit the adolescent's cooperation and encourage accurate responses.

Initial Visit

Assess at the first prenatal visit:

- Use in the 12 months before the adolescent became aware of her pregnancy
- Use during pregnancy including gestational age, types, amount, and frequency
- Method of use (inhaled, free-based, injected, ingested)
- Age use began
- Motivation to decrease/stop use during and after pregnancy
- History of treatment programs including support group involvement
- Social context/reasons for use
- Substance use by partner, friends, family members
- Underlying depression, eating disorders

Additional Considerations

- Avoid asking questions that can be answered with a "yes" or "no"
- Assume use and ask "how much" rather than "do you use..."
- Determining substance use before pregnancy awareness may be a more accurate measure of use during the first trimester and predictor of use during and after pregnancy.^{11, 35}

- Ask about each type of substance separately, progressing from the less threatening over-the-counter and prescription drugs to cigarettes, alcohol and illicit drugs. Use the more familiar, "street" names for drugs.
- Ask about size of drinking glass when evaluating alcohol intake.
- Use urine/blood toxicologies as needed.¹³
- Substance use begun at an early age may suggest progression to polydrug use.
- Method of use indicates extent of drug involvement and possible associated risks.
- Summarize information given and clarify unclear responses.
- Determine level of motivation to make positive changes and potential strengths and barriers.
- Document findings in medical record.

Other Indicators of Substance Use

In addition to information obtained through the interview, general appearance, affect or clinical signs may indicate possible substance use or abuse (see Table 5).

Subsequent Visits

Reassessment of substance use patterns throughout pregnancy is important since the adolescent may stop using substances when she becomes aware of her pregnancy but relapse in later pregnancy. For example, one-third of smokers who quit during early pregnancy have been found to resume smoking in later gestation, when it has the greatest impact on fetal growth.³¹

EDUCATION AND COUNSELING

With education and support, most pregnant adolescents will be motivated to decrease or avoid substances out of concern for the developing infant.³ Although the sooner substance use is stopped in pregnancy, the better the outcome, potential benefits of stopping or decreasing use at any stage of pregnancy include:

- Improved health and nutrition status of the adolescent
- Improved self-esteem and sense of well-being of the adolescent

TABLE 5
Possible Indicators of Substance Use

Poor hygiene
 Odor on breath or clothes (marijuana, alcohol, solvents)
 Needle marks
 Gang or cult involvement
 Homelessness, poverty
 Watery eyes or nose
 Droopy eyelids or reddened eyes
 Depression or euphoria
 Anxiety, hyperactivity, extremely talkative
 Wide mood/emotional swings
 Confusion, slurred speech, poor coordination or drowsiness
 Elevated blood pressure or heart rate
 Weight loss or inadequate weight gain
 Missed clinic appointments
 Legal, school or family problems

- Opportunity for fetal catch-up growth and improved birthweight, particularly with cessation of tobacco and alcohol use before the third trimester²⁵
- Less severe consequences of substance use
- Reduced risk of preterm labor
- Decreased risk of SIDS in the newborn

Counseling Strategies

- Summarize the findings of the assessment. Reinforce positive changes in substance use already made and express areas of concern.
- Explain in simple, concrete terms concerns of substance use throughout pregnancy. Discuss possible outcomes meaningful to the adolescent, such as an infant that may be more difficult to care for, less intelligent, less attractive, etc.

- Through use of visual materials of the placenta and fetus, show that chemicals the adolescent uses reach her developing infant.
- Emphasize fetal movement, heart tones, ultrasound and pictures of fetal growth and development to help the adolescent bond to her infant.³
- Include the adolescent's partner and family in the message to abstain from substance use.
- Advise abstinence from tobacco, alcohol and illicit drugs throughout pregnancy since a safe level or time of use is not known.
- Advise moderation in caffeine intake (e.g., less than 150 mg/day).³⁶
- Provide support and encouragement to stop substance use. Using a positive approach, focus on the likelihood of a healthier infant by stopping substance use, rather than on possible damage that may occur if use is continued.³ Emphasize that it is never too late in pregnancy to stop use.
- Dispel myths about substance use (e.g., to control weight gain, manage nausea or stress, lessen pain associated with labor and delivery).³⁷
- Avoid guilt, shame or scare tactics and judgmental or confrontational attitudes, which may result in rebellion, higher levels of use or failure of the adolescent to return for care.
- Use a health care team approach with all members consistently giving the message to avoid substance use throughout pregnancy at each visit.
- Help the adolescent develop an incentive/reward system for progress made.
- Continue support to avoid substance use after delivery.

Intervention Strategies

- Assess the adolescent's degree of addiction and counsel according to readiness stages of behavioral change³⁸ and principles of motivational interviewing.
- Use a written contract for behavioral change.
- Monitor and discuss progress at each visit, reinforcing the benefits of abstinence, reinforcing positive

changes made and discussing setbacks in a non-punitive manner. See the adolescent at more frequent intervals and include phone contacts between visits if possible.

- Suggest options for alternative habits and activities (e.g., sugarless gum, exercise, list of coping strategies) and avoidance of people and situations that encourage use.
- Teach stress management and relaxation techniques.
- Monitor weight gain closely and encourage nutrient-dense meals and snacks.
- Prescribe a multivitamin and mineral supplement.
- Consider nicotine medications (gum, patch, nasal spray) if smoking cessation is not successful. No longer contraindicated in pregnancy, they may significantly increase success rates in quitting smoking, provide a lower and less variable blood level of nicotine, eliminate carbon monoxide exposure and lessen withdrawal symptoms.²⁷

Referral

If the adolescent is unable to decrease substance use within two weeks, or if heavy substance use is apparent or suspected, continue to coordinate prenatal care services and refer her to a culturally and developmentally appropriate resource for in depth assessment and treatment. In addition to inpatient and outpatient treatment programs, additional sources of support may include:

- School support groups
- Community programs
- Alcoholics Anonymous, Narcotics Anonymous
- Smoking cessation programs

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