

PJN

ISSN 1680-5194

PAKISTAN JOURNAL OF
NUTRITION

ANSI*net*

308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

Health Risks of Overweight and Obesity - An Over View

Aien khan Afridi, Mahpara Safdar, Muhammad Muzaffar Ali Khan Khattak and Alam Khan
Department of Human Nutrition, NWFP, Agricultural University, Peshawar, Pakistan
E-mail: alamkhandr@yahoo.com

Abstract: Obesity is a risk factor for the development of various diseases like CHD, hypertension, stroke, NIDDM, osteoarthritis, sleep apnea and cancers of endometrium, breast, prostate and colon. Psychological consequences of obesity range from lowered self-esteem to clinical depression. Many of these conditions are reversible through weight loss and maintenance. Weight reduction may be life saving so it is necessary to reduce weight.

Key words: Obesity, risk factor, coronary heart disease (CHD)

Introduction

The health consequences of obesity for adults range from a number of non fatal complaints that impact on the quality of life such as respiratory difficulties, musculoskeletal problems, skin problems and infertility; to complaints that lead to an increased risk of premature death including non insulin dependent diabetes mellitus (NIDDM), gallbladder disease, cardiovascular problems [hypertension, stroke and coronary heart disease (CHD)], osteoarthritis, sleep apnea and endometrial, breast, prostate and colon cancers. Psychological consequences of obesity range from lowered self-esteem to clinical depression. Many of these conditions are reversible through weight loss and maintenance. Weight reduction may be life saving so it is necessary to reduce weight. Obesity, now an epidemic of global proportions is creating major health problems worldwide. It is well established that obesity is associated with a substantial burden of illness and health care costs (Bjorntorp, 1997; Rabkin *et al.*, 1997). Obesity has been reported to be associated with higher mortality (Fitzgerald and Jarret, 1992) and morbidity (Kannel *et al.*, 1991). Prevalence and prevention of obesity has been reviewed earlier (Afridi *et al.*, 2003), this manuscript reviews the health risks of obesity

Morbidity of Obesity: Morbidity for a number of health conditions increases as BMI increases above 20. Obesity is associated with the development of several diseases, including hypertension (Reeder *et al.*, 1997; Loggie *et al.*, 1984; Havlik *et al.*, 1983), dyslipidemia and NIDDM (Harris *et al.*, 1998; Ford *et al.*, 1997; Colditz *et al.*, 1995, 1990; Chan *et al.*, 1994; Manson *et al.*, 1992), hyperlipidemia (Wilcosky *et al.*, 1990; Freedman *et al.*, 1990), CHD (Willett *et al.*, 1995; Rabkin *et al.*, 1997; Harris *et al.*, 1997), stroke (Rexrode *et al.*, 1997; Walker *et al.*, 1996), obstructive sleep apnea, (Chua and Chediak, 1994; Loubé *et al.*, 1994; Shepard *et al.*, 1992; Wittels and Thompson, 1990; Smith *et al.*, 1985), Osteoarthritis, (Gelber *et al.*, 1999; Cicuttini *et al.*, 1996;

Hochberg *et al.*, 1995; Carman *et al.*, 1994; Hart and Spector, 1993), cholelithiasis/gallstones (Stampfer *et al.*, 1992) and cancers of the breast, (Huang *et al.*, 1997; Ballard-Barbash and Swanson, 1996), uterus, (Ballard-Barbash and Swanson, 1996; Kelsey *et al.*, 1982) prostate (Snowdon *et al.*, 1982) and colon (Giovannucci, 1995, Giovannucci *et al.*, 1995, 1996; Phillips and Snowdon, 1985). It is also associated with psychological disorders, including depression (Stunkard and Wadden, 1992; Wadden and Stunkard 1985; Wardle, 1996), low self-esteem (Myers and Rosen, 1999) anorexia nervosa and bulimia. (Wardle, 1996; Sarlio-Lahteenkorva *et al.*, 1995). Furthermore, obesity is associated with complications of pregnancy, menstrual irregularities and hirsutism (Prentice and Goldberg, 1996; Rich-Edwards *et al.*, 1994; Smith *et al.*, 1994; Keppel and Taffel, 1993; Garbaciak *et al.*, 1985)

Hypertension: High blood pressure, defined as mean systolic blood pressure ≥ 140 mm Hg, or mean diastolic blood pressure ≥ 90 mm Hg, or currently taking anti-hypertensive medication. Obesity and hypertension are co-morbid risk factors for the development of cardiovascular disease. The patho-physiology underlying the development of hypertension associated with obesity includes sodium retention and associated increases in vascular resistance, blood volume and cardiac output. These cardiovascular abnormalities associated with obesity are believed to be related to a combination of increased sodium retention, increased sympathetic nervous system activity, alterations of the rennin-angiotensin system and insulin resistance. The precise mechanism whereby weight loss results in a decrease in blood pressure is unknown. However, it is known that weight loss is associated with a reduction in vascular resistance and total blood volume and cardiac output, an improvement in insulin resistance, a reduction in sympathetic nervous system activity and suppression of the activity of the rennin-angiotensin aldosterone system (Reeder *et al.*, 1997; Jacobs and

Sowers, 1993; Frohlich *et al.*, 1992; Landsberg and Krieger, 1989; Rocchini *et al.*, 1989; Loggie *et al.*, 1984; Havlik *et al.*, 1983).

Dyslipidemia: Higher body weight is associated with higher levels of total serum cholesterol, defined as ≥ 240 mg/dL in both men and women (Denke *et al.*, 1994, 1993) at levels of BMI > 25 . Several large longitudinal studies provide evidence that obesity is associated with increased cholesterol levels (Hershcopf *et al.*, 1982). In women, the incidence of hypercholesterolemia increases with increasing BMI (Manson *et al.*, 1990). Total cholesterol levels are usually higher in persons with predominant abdominal obesity (Reeder *et al.*, 1992 <[http:// www. nhlbi. nih. gov/ guidelines/ obesity/e_txbk/refs/refmenu.htm](http://www.nhlbi.nih.gov/guidelines/obesity/e_txbk/refs/refmenu.htm)>).

The strong association of triglyceride levels with BMI has been shown in both cross-sectional and longitudinal studies, for both sexes and all age groups (Denke *et al.*, 1994 and 1993 <[http://www.nhlbi.nih.gov/guidelines/ obesity/e_txbk/refs/refmenu.htm](http://www.nhlbi.nih.gov/guidelines/obesity/e_txbk/refs/refmenu.htm)>; Mann *et al.*, 1988). HDL-cholesterol levels at all ages and weights are lower in men than in women. Low HDL-cholesterol is defined as < 35 mg/dL in men and < 45 mg/dL in women (Brown *et al.*, 1998). Cross-sectional studies have reported that HDL-cholesterol levels are lower in men and women with higher BMI (Garrison *et al.*, 1980; Glueck *et al.*, 1980). Longitudinal studies have found that changes in BMI are associated with changes in HDL-cholesterol. A BMI change of 1 unit is associated with an HDL-cholesterol change of 1.1 mg/dL for young adult men and an HDL-cholesterol change of 0.69 mg/dL for young adult women (Anderson *et al.*, 1987).

Non insulin dependent diabetes mellitus (NIDDM): The increased risk of diabetes, as weight increases, has been shown by prospective studies in Norway (Westlund and Nicolaysen, 1972), the United States (Lew and Garfinkel, 1979), Sweden (Larsson *et al.*, 1981) and Israel (Medalie *et al.*, 1974). More recent studies found that the risk of developing NIDDM increases as BMI increases from 22 (Colditz *et al.*, 1990). The development of NIDDM has been found to be associated with weight gain after age 18 in both men and women (Chan *et al.*, 1994; Colditz *et al.*, 1990). The relative risk of diabetes increases by approximately 25 percent for each additional unit of BMI over 22 (Colditz *et al.*, 1995). Both cross-sectional (Haffner *et al.*, 1991; Despres *et al.*, 1989) and longitudinal studies (Chan *et al.*, 1994; Lundgren *et al.*, 1989 <[http://www. nhlbi. nih. gov/guidelines/obesity/e_txbk/refs/refmenu.htm](http://www.nhlbi.nih.gov/guidelines/obesity/e_txbk/refs/refmenu.htm)>) show that abdominal obesity is a major risk factor for NIDDM. Khan *et al.* (1994) reported that 95% of male and almost all of the female diabetic individuals were overweight at the onset of diabetes on WHO standards.

Coronary heart disease: Numerous studies have shown that obesity and excess abdominal fat are directly related to cardiovascular risk factors. Obesity and abdominal fat are also associated with increased morbidity and mortality from CHD (Higgins *et al.*, 1988; Donahue and Abbott, 1987; Lapidus *et al.*, 1989; Larson *et al.*, 1984; Hubert *et al.*, 1983).

Recent studies have shown that the risks of nonfatal myocardial infarction and CHD death increase with increasing levels of BMI. Risks are lowest in men and women with BMI of 22 or less and increase with even modest elevation of BMI. Relative risks for CHD are twice as high at BMI of 25 to 28.9 and more than three times as high at BMI of 29 or greater, compared with BMI of less than 21 (Willett *et al.*, 1995). In British men, CHD incidence increased at BMI above 22 and an increase of 1 BMI unit was associated with a 10 percent increase in the rate of coronary events (Shaper *et al.*, 1997). Similar relationships between increasing BMI and CHD risk have been shown in Finnish, Swedish, Japanese and U.S. populations (Jousilahti *et al.*, 1996; Willet *et al.*, 1995; Tokunaga *et al.*, 1991).

Congestive heart failure: Overweight and obesity have been identified as important and independent risk factors for congestive heart failure (CHF) in a number of studies (Eriksson *et al.*, 1991, 1989). CHF is a frequent complication of severe obesity and a major cause of death; duration of the obesity is a strong predictor of CHF (Shimizu and Isogai, 1993). Since hypertension and NIDDM are positively associated with increasing weight, the coexistence of these conditions facilitates the development of CHF (Urbina *et al.*, 1995).

Obesity can result in alterations in cardiac structure and function even in the absence of systemic hypertension or underlying heart disease. Ventricular dilatation and eccentric hypertrophy may result from elevated total blood volume and high cardiac output. Diastolic dysfunction from eccentric hypertrophy and systolic dysfunction from excessive wall stress result in so-called "obesity cardio-myopathy" (Alpert and Hashimi, 1993; Garavaglia *et al.*, 1988).

Stroke: The relationship of cerebrovascular disease to obesity has not been as well studied as the relationship to CHD. One report suggests that overweight might contribute to the risk of stroke, independent of the known association of hypertension and diabetes with stroke (Hubert *et al.*, 1983).

Recent prospective study has demonstrated that the risk of stroke shows a graded increase as BMI rises. For example, ischemic stroke risk is 75 percent higher in women with BMI > 27 and 137 percent higher in women with a BMI > 32 , compared with women having a BMI < 21 (Rexrode *et al.*, 1997).

Gallstones: The risk of gallstones increases with adult weight. Risk of gallstones is as high as 20 per 1,000 women per year when BMI is above 40, compared with 3 per 1,000 among women with BMI < 24 (Stampfer *et al.*, 1992).

Osteoarthritis: Individuals who are overweight or obese increase their risk for the development of osteoarthritis (Cicuttini *et al.*, 1996; Hochberg *et al.*, 1995; Carman *et al.*, 1994; Hart and Spector, 1993). The association between increased weight and the risk for development of knee osteoarthritis is stronger in women than in men (Felson *et al.*, 1988). In a study of twin middle-aged women, it was estimated that for every kilogram increase of weight, the risk of developing osteoarthritis increases by 9 to 13 percent. The twins with knee osteoarthritis were generally 3 to 5 kg heavier than the co-twins with no disease (Cicuttini *et al.*, 1996). An increase in weight is significantly associated with increased pain in weight-bearing joints (Huang *et al.*, 1997). There is no evidence that the development of osteoarthritis leads to the subsequent onset of obesity (Carman *et al.*, 1994).

Sleep apnea: Obesity, particularly upper body obesity, is a risk factor for sleep apnea and has been shown to be related to its severity (Millman *et al.*, 1995; Young *et al.*, 1993). The major pathophysiologic consequences of severe sleep apnea include arterial hypoxemia, recurrent arousals from sleep, increased sympathetic tone, pulmonary and systemic hypertension and cardiac arrhythmias (Shepard, 1992). Most people with sleep apnea have a BMI > 30 (Chua and Chediak, 1994; Loubé *et al.*, 1994). Large neck girth in both men and women who snore is highly predictive of sleep apnea. In general, men whose neck circumference is 17 inches or greater and women whose neck circumference is 16 inches or greater are at higher risk for sleep apnea (Davies and Stradling, 1990).

Colon cancer: Many studies have found a positive relation between obesity and colon cancer in men but a weaker association in women (Martinez *et al.*, 1996; Giovannucci, 1995; Bostick *et al.*, 1994; Lee and Paffenbarger, 1993; Le-Marchand *et al.*, 1992; Chute *et al.*, 1991). More recent data suggest that the relationship between obesity and colon cancer in women may be similar to that seen in men. Twice as many women with a BMI of > 29 has distal colon cancer as women with a BMI < 21 (Giovannucci *et al.*, 1996). In men, the relationship between obesity and total colon cancer is weaker than that for distal colon cancer.

Breast cancer: Epidemiological studies show that obesity is directly related to mortality from breast cancer, predominantly in postmenopausal women (Lew and

Garfinkel, 1979), but inversely related to the incidence of premenopausal breast cancer (Chu *et al.*, 1991; Willett *et al.*, 1985; Helmrich *et al.*, 1983). Among postmenopausal women, peripheral fat is the primary source of estrogens, the major modifiable risk factor for postmenopausal breast cancer.

This crossover in the relationship of obesity with breast cancer, pre- and postmenopausally, complicates prevention messages for this common female cancer. Recent data however, show that adult weight gain is positively related to risk of postmenopausal breast cancer. This relation is seen most clearly among women who do not use postmenopausal hormones. A gain of more than 20 lb from age 18 to midlife doubles a woman's risk of breast cancer. Even modest weight gains are positively related to risk of postmenopausal cancer (Huang *et al.*, 1997).

Endometrial cancer: Obesity increases the risk of endometrial cancer. The risk is three times higher among obese women (BMI \geq 30) than among normal-weight women. However, the absolute risk of this condition is low when compared to breast cancer, heart disease and diabetes. Adult weight gain is also related to increased risk (Schottenfeld and Fraumeni, 1996).

Women's reproductive health: Obesity in premenopausal women is associated with menstrual irregularity and amenorrhea (Hartz *et al.*, 1977). The greater the BMI at age 18 years, even at levels lower than those considered obese, the greater the risk of subsequent ovulatory infertility (Rich-Edwards *et al.*, 1994). The most prominent condition associated with abdominal obesity is polycystic ovarian syndrome (Dunaif, 1992), a combination of infertility, menstrual disturbances, hirsutism, abdominal hyper-androgynism and an-ovulation. This syndrome is strongly associated with hyper-insulinemia and insulin resistance (Garbaciak *et al.*, 1985).

Pregnancy can result in excessive weight gain and retention. (Smith *et al.*, 1994; Keppel and Taffel, 1993) Higher pre-pregnancy weights have been shown to increase the risk of late fetal deaths (Cnattingius *et al.*, 1998). Obesity during pregnancy is associated with increased morbidity for both the mother and the child. A tenfold increase in the prevalence of hypertension and a 10 percent incidence of gestational diabetes has been reported in obese pregnant women (Johnson *et al.*, 1987). Obesity also is associated with difficulties in managing labor and delivery, leading to a higher rate of induction and primary Caesarean section. Risks associated with anesthesia are higher in obese women, as there is greater tendency toward hypoxemia and greater technical difficulty in administering local or general anesthesia (Prentice and Goldberg, 1996). Finally, obesity during pregnancy is associated with an

increased risk of congenital malformations, particularly of neural tube defects (Prentice and Goldberg, 1996).

Psychosocial Aspects of Obesity

Social stigmatization: In most of the world societies there are powerful messages that people, especially women, should be thin and that to be fat is a sign of poor self-control (Brownell and Fairburn, 1995; Wadden and Stunkard, 1993; DeJong and Kleck, 1986; Jarvie *et al.*, 1983; Allon, 1982). Negative attitudes about the obese have been reported in children and adults (Lerner and Korn, 1972; Staffieri, 1972, 1967; Richardson *et al.*, 1961), in health care professionals (Blumberg and Mellis, 1985) and in the overweight themselves (Crandall and Biernat, 1990; Maddox *et al.*, 1968).

People's negative attitudes toward the obese often translate into discrimination in employment opportunities (Pingitore *et al.*, 1994; Larkin and Pines, 1979; Roe and Eickwort, 1976), college acceptance (Canning and Mayer, 1996), less financial aid from their parents in paying for college (Crandall and Biernat, 1990; Crandall, 1991), job earnings (Sargent and Blanchflower, 1994), rental availabilities (Karris, 1977) and opportunities for marriage (Gortmaker *et al.*, 1993).

Psychopathology: Research relating obesity to psychological disorders and emotional distress is based on community studies and clinical studies of patients seeking treatment. In general, community-based studies have not found significant differences in psychological status between the obese and non obese (Wadden and Stunkard, 1993, 1987; O'Neil and Jarrell, 1992). However, several recent European studies in general populations do suggest a relationship between obesity and emotional problems (Lissau and Sorensen, 1994; Sullivan *et al.*, 1993; Lapidus *et al.*, 1989). Thus, it may be premature to state that there is no association between obesity and psychopathology or emotional distress in the general population. More focused, hypothesis-driven and long-term studies are needed (Friedman and Brownell, 1995).

Binge eating disorder: Binge eating disorder (BED) is characterized by eating larger amounts of food than most people would eat in a discrete time period (e.g., 2 hours) with a sense of lack of control during these episodes (American Psychiatric Association, 1994). BED is estimated to occur in 20 to 50 percent of individuals who seek specialized obesity treatment (Marcus *et al.*, 1995; Gormally *et al.*, 1982; Loro and Orleans, 1981). Comparisons have been made between BED and bulimia nervosa (BN), an eating disorder characterized by recurrent and persistent binge eating, accompanied by the regular use of behaviors such as vomiting, fasting, or using laxatives. Studies comparing normal-weight individuals who have BN with obese BED individuals have found that obese binge eaters are less

likely to demonstrate dietary restraint and show few if any adverse reactions to moderate or severe dieting. Most obese binge eaters do not engage in inappropriate compensatory behaviors such as purging (Yanovski *et al.*, 1994).

Compared with BN, the demographic distribution of BED is broader with respect to age, gender and race (Marcus *et al.*, 1995; Spitzer *et al.*, 1993, 1992; Wilfley and Cohen, 1997, 1993; Yanovski, 1993; Yanovski and Sebring, 1994). The difference between BED and BN is dramatic regarding gender. Very few men have BN (Fairburn and Wilson, 1993), whereas the distribution is close to equal in BED (Striegel-Moore *et al.*, 1998; Castonguay *et al.*, 1995).

Compared to obese non bingers, obese individuals with BED tend to be heavier (Telch *et al.*, 1988). Obese individuals with BED have greater psychological distress and have more psychiatric illness (Molinari *et al.*, 1997; Kenardy *et al.*, 1996; Mussell *et al.*, 1996; Specker *et al.*, 1994). Other studies have reported an earlier onset of obesity and a greater percentage of their lifetime on a diet (Brody *et al.*, 1994; De Zwann *et al.*, 1992).

Some studies have shown histories of greater weight fluctuation or weight cycling in obese binge eaters compared with nonbingers (Brody *et al.*, 1994; Spitzer *et al.*, 1992; De-Zwaan *et al.*, 1992), but others have not (Kuehnell and Wadden, 1994). These individuals are also more likely than nonbinging obese people to drop out of behavioral weight loss programs (Marcus *et al.*, 1988) and to regain weight more quickly (Yanovski *et al.*, 1994; Marcus *et al.*, 1988; Keefe *et al.*, 1984).

Critics of behavioral treatment of obesity have argued that caloric restriction may cause or contribute to the episodes of binge eating and BN (Marcus *et al.*, 1995; Yanovski and sebring, 1994; Telch and Agras, 1993; Garner and Wooly 1991).

Body image: Body image is defined as the perception of one's own body size and appearance and the emotional response to this perception (O'Neil and Jarrel, 1992; Cash and Hicks, 1990). Inaccurate perception of body size or proportion and negative emotional reactions to size perceptions contribute to poor body image. Obese individuals, especially women, tend to overestimate their body size (Collins, 1987; Collins *et al.*, 1990).

People at greater risk for a poor body image are binge eaters, women, those who were obese during adolescence or with early onset of obesity and those with emotional disturbances (Mussel *et al.*, 1996; Faith and Allison, 1996; Mussel *et al.*, 1996; Grilo *et al.*, 1994; Cash and Hicks, 1990). It is no surprise, then, that in some groups of obese persons, these individuals are more dissatisfied and preoccupied with their physical appearance and avoid more social situations due to their appearance (Cash, 1990; Tiggemann and Rothblum, 1988).

Mortality of Obesity: Obesity has been reported to be associated with higher mortality, with an estimated reduction in life expectancy of about 1 year (Manson *et al.*, 1995; Fitzgerald and Jarrett, 1992).

The nature of obesity-related health risks is similar in all populations, although the specific level of risk associated with a given level of overweight or obesity may vary with race/ethnicity and also with age, gender and societal conditions. For example, the absolute risk of morbidity in chronic conditions such as CHD is highest in the aged population, while the relative risk of having CHD in obese versus non obese individuals is highest in the middle adult years (Rabkin, 1997; Feinleib, 1985).

In the majority of epidemiologic studies, mortality begins to increase with BMI above 25. The increase in mortality generally tends to be modest until a BMI of 30 is reached. For persons with a BMI of 30 or above, mortality rates from all causes and especially from cardiovascular disease, are generally increased by 50 to 100 percent above that of persons with BMI in the range of 20 to 25 (Troiano *et al.*, 1996; WHO, 1995; VanItallie and Lew, 1990; Manson *et al.*, 1990; VanItalli, 1985).

Many epidemiologic studies of BMI and mortality have reported a 'U-' or 'J-shaped' relationship between BMI and mortality (WHO, 1995). Mortality rates are elevated in persons with low BMI (usually below 20) as well as in persons with high BMI (Troiano *et al.*, 1996; WHO, 1995; Manson *et al.*, 1990). In some studies, adjustment for factors that potentially confound the relationship between BMI and mortality, such as smoking status and pre-existing illness, tends to reduce the upturn in mortality rate at low BMIs (Manson *et al.*, 1990), but in a meta-analysis the higher mortality at low BMIs was not eliminated after adjustment for confounding factors (Troiano *et al.*, 1996). It is unclear whether the elevated mortality observed at low BMIs is due to an artifact of incomplete control for confounding factors (Lee *et al.*, 1993), inadequate body fat and/or inadequate body protein stores that result from unintentional weight loss (Alison *et al.*, 1997), or individual genetic factors. Currently, there is no evidence that intentional weight gain in persons with low BMI will lead to a reduction in mortality.

Many epidemiological studies suggest that the relationship between BMI and mortality weakens with increasing age, especially among persons aged 75 and above (Stevens *et al.*, 1998; Diehr *et al.*, 1998; Cornoni-Huntley *et al.*, 1991; Harris *et al.*, 1988). Several factors have been proposed to explain this observation. Older adults are more likely than younger adults to have diseases that both increase mortality and cause weight loss leading to lower body weight (Fried *et al.*, 1998; Baumgartner *et al.*, 1995; Losonczy *et al.*, 1995). In addition, as people age, they tend to have larger waist circumferences that increase their risk of mortality even

at lower BMI (Folsom *et al.*, 1993). Also, weight in middle age is positively related to risk of mortality in old age (Losonczy *et al.*, 1995). The impact of smoking on body weight and mortality is likely to be much stronger in older adults because of the cumulative health effects of smoking (Willett *et al.*, 1991). BMI, which is an indirect estimate of adiposity, may underestimate adiposity in older adults whose BMI is similar to younger adults (Roche, 1994).

References

- Afridi, A.K., A. Khan and M. Safdar, 2003. Prevalence and Etiology of Obesity-An overview. (Submitted for publication).
- Allison, D.B., M.S. Faith, M. Heo and D.P. Kotler, 1997. Hypothesis concerning the U-shaped relation between body mass index and mortality. *Am. J. Epidemiol.*, 146: 339-349.
- Allon, N., 1982. The stigma of overweight in everyday life. In: Wolman, B.B. and DeBerry, S., eds. *Psychological Aspects of Obesity: A Handbook*. New York: Van Nostrand Reinhold, 130-174.
- Alpert, M.A. and M.W. Hashimi, 1993. Obesity and the heart. *Am. J. Med. Sci.*, 306: 117-123.
- American Psychiatric Association, 1994. *Task Force on DSM-IV, Diagnostic and Statistical Manual of Mental Disorders: DSM-IV*. 4th ed. Washington, DC.
- Anderson, K.M., P.W.F. Wilson, R.J. Garrison and W.P. Castelli, 1987. Longitudinal and secular trends in lipoprotein cholesterol measurements in a general population sample: The Framingham offspring study. *Atherosclerosis*, 68: 59-66.
- Ballard-Barbash, R. and C.A. Swanson, 1996. Body weight: estimation of risk for breast and endometrial cancers. *Am. J. Clin. Nutr.*, 63: 437S-441S.
- Baumgartner, R.N., S.B. Heymsfield and A.F. Roche, 1995. Human body composition and the epidemiology of chronic disease. *Obes. Res.*, 3: 73-95.
- Bjorntorp, P., 1997. Obesity. *Lancet*, 350: 423-426.
- Blumberg, P. and L.P. Mellis, 1985. Medical students' attitudes toward the obese and the morbidly obese. *Int. J. Eat Disord.*, 4: 169-175.
- Bostick, R.M., J.D. Potter and L.H. Kushi, 1994. Sugar, meat and fat intake and non-dietary risk factors for colon cancer incidence in Iowa women (United States). *Cancer Causes Control*, 5: 3 8-52.
- Brody, M.L., B.T. Walsh and M.J. Devlin, 1994. Binge eating disorder: reliability and validity of a new diagnostic category. *J. Consult Clin. Psychol.*, 62: 381-386.
- Brown, C.D., K.A. Donato and E. Obarzanek, 1998. Body mass index and prevalence of risk factors for cardiovascular disease. *Obes. Res.*, (Submitted for publication).

- Brownell, K.D. and C. Fairburn, 1995. Psychosocial consequences of obesity. In: Stunkard, A.J., Sobal, J.G., eds. *Eating Disorders and Obesity: A Comprehensive Handbook*. New York: Guilford Press; 417-421.
- Canning, H. and J. Mayer, 1996. Obesity: its possible effect on college acceptance. *N. Eng. J. Med.*, 275: 1172-1174.
- Carman, W.J., M. Sowers, V.M. Hawthorne and L.A. Weissfeld, 1994. Obesity as a risk factor for osteoarthritis of the hand and wrist: a prospective study. *Am. J. Epidemiol.*, 139: 119-129.
- Cash, T.F., 1990. The psychology of physical appearance: aesthetics, attributes and images. In: Cash, T.F. and Pruzinsky, T., eds. *Body Images: Development, Deviance and Change*. New York: Guilford Press, 51-79.
- Cash, T.F. and K.L. Hicks, 1990. Being fat versus thinking fat: relationships with body image, eating behaviors and well-being. *Cogni Ther Res.*, 14: 327-341.
- Castonguay, L.G., K.L. Eldredge and W.S. Agras, 1995. Binge eating disorder: current state and future directions. *Clin. Psychol. Rev.*, 15: 865-890.
- Chan, J.M., E.B. Rimm, G.A. Colditz, M.J. Stampfer and W.C. Willett, 1994. Obesity, fat distribution and weight gain as risk factors for clinical diabetes in men. *Diabetes Care*, 17: 961-969.
- Chu, S.Y., N.C. Lee, P.A. Wingo, R.T. Senie, R.S. Greenberg and H.B. Peterson, 1991. The relationship between body mass and breast cancer among women enrolled in the Cancer and Steroid Hormone Study. *J. Clin. Epidemiol.*, 44: 1197-1206.
- Chua, W. and A.D. Chediak, 1994. Obstructive sleep apnea. Treatment improves quality of life and may prevent death. *Postgrad. Med.*, 95: 123-126, 131: 135-138.
- Chute, C.G., W.C. Willett and G.A. Colditz, 1991. A prospective study of body mass, height and smoking on the risk of colorectal cancer in women. *Cancer Causes Control*, 2: 117-124.
- Cicuttini, F.M., J.R. Baker and T.D. Spector, 1996. The association of obesity with osteoarthritis of the hand and knee in women: a twin study. *J. Rheumatol.*, 23: 1221-1226.
- Cnattingius, S., R. Bergstrom, L. Lipworth and M.S. Kramer, 1998. Prepregnancy weight and the risk of adverse pregnancy outcomes. *New Eng. J. Med.*, 338: 147-152.
- Colditz, G.A., W.C. Willett and M.J. Stampfer, 1990. Weight as a risk factor for clinical diabetes in women. *Am. J. Epidemiol.*, 132: 501-513.
- Colditz, G.A., W.C. Willett, A. Rotnitzky and J.E. Manson, 1995. Weight gain as a risk factor for clinical diabetes mellitus in women. *Ann. Intern. Med.*, 122: 481-486.
- Collins, J.K., 1987. Methodology for the objective measurement of body image. *Int. J. Eat Disord.*, 6: 393-399.
- Collins, J.K., P.J. Beumont, S.W. Touyz and J. Krass, 1990. Variability in body shape, perception in anorexic, bulimic, obese and control subjects. *Int. J. Eat Disord.*, 6: 633-638.
- Cornoni-Huntley, J.C., T.B. Harris and D.F. Everett, 1991. An overview of body weight of older persons, including the impact on mortality. The National Health and Nutrition Examination Survey-I Epidemiologic Follow-up Study. *J. Clin. Epidemiol.*, 44: 743-753.
- Crandall, C.S., 1991. Do heavy-weight students have more difficulty paying for college? *Personality Soc. Psychol. Bull.*, 17: 606-611.
- Crandall, C.S. and M. Biernat, 1990. The ideology of anti-fat attitudes. *J. Appl. Soc. Psychol.*, 20: 227-243.
- Davies, R.J. and J.R. Stradling, 1990. The relationship between neck circumference, radiographic pharyngeal anatomy and the obstructive sleep apnoea syndrome. *Eur. Respir. J.*, 3: 509-514.
- De-Jong, W. and R.E. Kleck, 1986. The Social Psychological Effects of Overweight. In: Herman, C.P., Zanna, M.P., Higgins, E.T., eds. *Physical Appearance, Stigma and Social Behavior*. Hillsdale, NJ: L. Erlbaum, 65-88.
- Denke, M.A., C.T. Sempos and S.M. Grundy, 1993. Excess body weight. An under-recognized contributor to high blood cholesterol levels in white American men. *Arch. Intern. Med.*, 153: 1093-1103.
- Denke, M.A., C.T. Sempos and S.M. Grundy, 1994. Excess body weight. An under-recognized contributor to dyslipidemia in white American women. *Arch. Intern. Med.*, 154: 401-410.
- Despres, J.P., A. Nadeau and A. Tremblay, 1989. Role of deep abdominal fat in the association between regional adipose tissue distribution and glucose tolerance in obese women. *Diabetes*, 38: 304-309.
- De-Zwaan, M., D.O. Nutzinger and G. Schoenbeck, 1992. Binge eating in overweight women. *Compr Psychiatry*, 33: 256-261.
- Diehr, P., D.E. Bild, T.B. Harris, A. Duxbury, D. Siscovick and M. Rossi, 1998. Body mass index and mortality in nonsmoking older adults: The cardiovascular health study. *Am. J. Public Health*, 88: 623-629.
- Donahue, R.P. and R.D. Abbott, 1987. Central obesity and coronary heart disease in men. *Lancet*, 2: 1215.
- Dunaif, A., 1992. *Polycystic Ovary Syndrome*. Boston: Blackwell Scientific Publications; 1992.
- Fairburn, C.G. and G.T. Wilson, 1993. *Binge Eating: Nature, Assessment and Treatment*. New York: Guilford Press; 1993.

Afridi et al.: Health Risks of Overweight and Obesity - An Over View

- Faith, M.S. and D.B. Allison, 1996. Assessment of psychological status among obese persons. In: Thompson J.K, ed. *Body Image, Eating Disorders and Obesity: An Integrative Guide for Assessment and Treatment*. Washington, DC: American Psychological Association, 365-387.
- Feinleib, M., 1985. Epidemiology of obesity in relation to health hazards. *Ann. Intern. Med.*, 103: 1019-1024.
- Felson, D.T., J.J. Anderson, A. Naimark, A.M. Walker and R.F. Meenan, 1988. Obesity and knee osteoarthritis. The Framingham Study. *Ann. Intern. Med.*, 109: 18-24.
- Fitzgerald, A.P. and R.J. Jarrett, 1992. Body weight and coronary heart disease mortality: an analysis in relation to age and smoking habits: 15 years follow-up data from the Whitehall Study. *Int. J. Obes.*, 16: 119-23.
- Folsom, A.R., S.A. Kaye and T.A. Sellers, 1993. Body fat distribution and 5-year risk of death in older women. *JAMA*, 269: 483-487.
- Ford, E.S., D.F. Williamson and S. Liu, 1997. Weight change and diabetes incidence: findings from a national cohort of US adults. *Am. J. Epidemiol.*, 146: 214-222.
- Freedman, D.S., S.J. Jacobsen and J.J. Barboriak, 1990. Body fat distribution and male/female differences in lipids and lipoproteins. *Circulation*, 81: 1498-1506.
- Fried, L.P., R.A. Kronmal and A.B. Newman, 1998. Risk factors for 5-year mortality in older adults (for the Cardiovascular Health Study Collaborative Research Group). *JAMA*, 279: 585-592.
- Friedman, M.A. and K.D. Brownell, 1995. Psychological correlates of obesity: moving to the next research generation. *Psychol. Bull.*, 117: 3-20.
- Frohlich, E.D., C. Apstein and A.V. Chobanian, 1992. The heart in hypertension. *New Engl. J. Med.*, 327: 998-1008.
- Garavaglia, G.E., F.H. Messerli, B.D. Nunez, R.E. Schmieler and E. Grossman, 1988. Myocardial contractility and left ventricular function in obese patients with essential hypertension. *Am. J. Cardiol.*, 62: 594-597.
- Garbaciak, J.A. M. Richter, S. Miller and J.J. Barton, 1985. Maternal weight and pregnancy complications. *Am. J. Obstet. Gynecol.*, 152: 238-245.
- Garner, D.M. and S.C. Wooley, 1991. Confronting the failure of behavioral and dietary treatments for obesity. *Clin. Psychol. Rev.*, 11: 729-780.
- Garrison, R.J., P.W. Wilson, W.P. Castelli, M. Feinleib, W.B. Kannel and P.M. McNamara, 1980. Obesity and lipoprotein cholesterol in the Framingham offspring study. *Metabolism*, 29: 1053-1060.
- Gelber, A.C., M.C. Hochberg, L.A. Mead, N.Y. Wang, F.M. Wigley and M.J. Klag, 1999. Body mass index in young men and the risk of subsequent knee and hip osteoarthritis. *Am. J. Med.*, 107: 542-8.
- Giovannucci, E., 1995. Insulin and colon cancer. *Cancer Causes Control.*, 6: 164-179.
- Giovannucci, E., A. Ascherio, E.B. Rimm, G.A. Colditz, M.J. Stampfer and W.C. Willett, 1995. Physical activity, obesity and risk for colon cancer and adenoma in men. *Ann. Intern. Med.*, 122: 327-334.
- Giovannucci, E., G.A. Colditz, M.J. Stampfer and W.C. Willett, 1996. Physical activity, obesity and risk of colorectal adenoma in women (United States). *Cancer Causes Control*, 7: 253- 263.
- Glueck, C.J., H.L. Taylor, D. Jacobs, J.A. Morrison, R. Beaglehole and O.D. Williams, 1980. Plasma high-density lipoprotein cholesterol: association with measurements of body mass. The Lipid Research Clinics Program Prevalence Study. *Circulation*, 62: 62-69.
- Gormally, J., S. Black, S. Daston and D. Rardin, 1982. The assessment of binge eating severity among obese persons. *Addict. Behav.*, 7: 47-55.
- Gortmaker, S.L., A. Must, J.M. Perrin, A.M. Sobol and W.H. Dietz, 1993. Social and economic consequences of overweight in adolescence and young adulthood. *New Engl. J. Med.*, 329: 1008-1012.
- Grilo, C.M., D.E. Wilfley, K.D. Brownell and J. Rodin, 1994. Teasing, body image and self-esteem in a clinical sample of obese women. *Addict. Behav.*, 19: 443-450.
- Haffner, S.M., B.D. Mitchell, H.P. Hazuda and M.P. Stern, 1991. Greater influence of central distribution of adipose tissue on incidence of non-insulin-dependent diabetes in women than men. *Am. J. Clin. Nutr.*, 53: 1312- 1317.
- Harris, M.I., K.M. Flegal and C.C. Cowie, 1998. Prevalence of diabetes, impaired fasting glucose and impaired glucose tolerance in U.S. adults. The Third National Health and Nutrition Examination Survey, 1988-94. *Diabetes Care*, 21: 518 -524.
- Harris, T., E.F. Cook, R. Garrison, M. Higgins, W. Kannel and L. Goldman, 1988. Body mass index and mortality among nonsmoking older persons. The Framingham Heart Study. *JAMA*, 259: 1520-1524.
- Harris, T.B., L.J. Launer, J. Madans and J.J. Feldman, 1997. Cohort study of effect of being overweight and change in weight on risk of coronary heart disease in old age. *BMJ*, 314: 1791-1794.
- Hart, D.J. and T.D. Spector, 1993. The relationship of obesity, fat distribution and osteoarthritis in women in the general population: the Chingford Study. *J. Rheumatol*, 20: 331-335.
- Hartz, A.J., P.N. Barboriak, A. Wong, K.P. Katayaa and A.A. Rimm, 1977. The association of obesity with infertility and related menstrual abnormalities in women. *Int. J. Obes.*, 3: 57-73.
- Havlik, R.J., H.B. Hubert, R.R. Fabsitz and M. Feinleib, 1983. Weight and hypertension. *Ann. Intern. Med.*, 98: 855-859.

Afridi et al.: Health Risks of Overweight and Obesity - An Over View

- Helmrich, S.P., S. Shapiro and L. Rosenberg, 1983. Risk factors for breast cancer. *Am. J. Epidemiol.*, 117: 35-45.
- Hershcopf, R.J., D. Elahi and R. Andres, 1982. Longitudinal changes in serum cholesterol in man: an epidemiologic search for an etiology. *J. Chronic Dis.*, 35: 101-114.
- Higgins, M., W. Kannel, R. Garrison, J. Pinsky and J. Stokes, 1988. Hazards of obesity--the Framingham experience. *Acta Med. Scand. Suppl.*, 723: 23-36.
- Hochberg, M.C., M. Lethbridge-Cejku, W.W. Scott, Jr. R. Reichle, C.C. Plato and J.D. Tobin, 1995. The association of body weight, body fatness and body fat distribution with osteoarthritis of the knee: data from the Baltimore Longitudinal Study of Aging. *J. Rheumatol.*, 22: 488-493.
- Huang, Z., S.E. Hankinson and G.A. Colditz, 1997. Dual effects of weight and weight gain on breast cancer risk. *JAMA*, 278: 1407-1411.
- Hubert, H.B., M. Feinleib, P.M. McNamara and W.P. Castelli, 1983. Obesity as an independent risk factor for cardiovascular disease: a 26 year follow-up of participants in the Framingham Heart Study. *Circulation*, 67: 968-977.
- Jacobs, D.B. and J.R. Sowers, 1993. Effects of weight reduction on cellular cation metabolism and vascular resistance. *Hypertension*, 21: 308-314.
- Jarvie, G.J., B.B. Lahey, W. Graziano and E. Framer, 1983. Childhood obesity and social stigma: what we know and what we don't know. *Dev. Rev.*, 3: 237-273.
- Johnson, S.R., B.H. Kolberg, M.W. Varner and L.D. Railsback, 1987. Maternal obesity and pregnancy. *Surg Gynecol. Obstet.*, 164: 431-437.
- Jousilahti, P., J. Tuomilehto, E. Vartiainen, J. Pekkanen and P. Puska, 1996. Body weight, cardiovascular risk factors and coronary mortality. 15-year follow-up of middle-aged men and women in eastern Finland. *Circulation.*, 93: 1372-1379.
- Kannel, W.B., L.A. Cupples, R. Ramaswami, J. Stokes, B.E. Kreger and M. Higgins, 1991. Regional obesity and risk of cardiovascular disease; the Framingham study. *J. Clin. Epidemiol.*, 44: 183-90.
- Karris, L., 1977. Prejudice against obese renters. *J. Soc. Psych.*, 101: 159-160.
- Keefe, P.H., D. Wyshogrod, E. Weinberger and W.S. Agras, 1984. Binge eating and outcome of behavioral treatment of obesity: a preliminary report. *Behav. Res. Ther.*, 22: 319-321.
- Kelsey, J.L., V.A. LiVolsi, T.R. Holford, D.B. Fischer, E.D. Mostow and P.E. Schwartz, 1982. A case-control study of cancer of the endometrium. *Am. J. Epidemiol.*, 116: 333-42.
- Kenardy, J., B. Arnou and W.S. Agras, 1996. The aversiveness of specific emotional states associated with binge-eating in obese subjects. *Aust. N. Z. J. Psychiatry*, 30: 839-844.
- Keppel, K.G. and S.M. Taffel, 1993. Pregnancy-related weight gain and retention: implications of the 1990 Institute of Medicine guidelines. *Am. J. Public Health*, 83: 1100-1103.
- Kuehnel, R.H. and T.A. Wadden, 1994. Binge eating disorder, weight cycling and psychopathology. *Int. J. Eat Disord.*, 15: 321-329.
- Landsberg, L. and D.R. Krieger, 1989. Obesity, metabolism and the sympathetic nervous system. *Am. J. Hypertension.*, 2: 125S-132S.
- Lapidus, L., C. Bengtsson, T. Hallstrom and P. Bjorntorp, 1989. Obesity, adipose tissue distribution and health in women results from a population study in Gothenburg, Sweden. *Appetite*, 12: 25-35.
- Larkin, J.C. and H.A. Pines, 1979. No fat persons need apply: experimental studies of the overweight stereotype and hiring preference. *Sociology of Work and Occupations*, 6: 312-327.
- Larsson, B., P. Bjorntorp and G. Tibblin, 1981. The health consequences of moderate obesity. *Int. J. Obes.*, 5: 97-116.
- Larsson, B., K. Svardsudd, L. Welin, L. Wilhelmsen, P. Bjorntorp and G. Tibblin, 1984. Abdominal adipose tissue distribution, obesity and risk of cardiovascular disease and death: 13 year follow up of participants in the study of men born in 1913. *BMJ*, 288: 1401-1404.
- Lee, I.M., J.E. Manson, C.H. Hennekens and R.S. Paffenbarger, Jr. 1993. Body weight and mortality. A 27-year follow-up of middle-aged men. *JAMA*, 270: 2823-2828.
- Lee, I.M. and R.S. Paffenbarger, Jr., 1992. Quetelet's index and risk of colon cancer in college alumni. *J. Natl. Cancer Inst.*, 84: 1326-1331.
- Le-Marchand, L., L.R. Wilkens and M.P. Mi, 1992. Obesity in youth and middle age and risk of colorectal cancer in men. *Cancer Causes Control*, 3: 349-354.
- Lerner, R.M. and S.J. Korn, 1972. The development of body build stereotypes in males. *Child Dev.*, 43: 908-920.
- Lew, E.A. and L. Garfinkel, 1979. Variations in mortality by weight among 750,000 men and women. *J. Chronic Dis.*, 32: 563-576.
- Lissau, I. and T.I. Sorensen, 1994. Parental neglect during childhood and increased risk of obesity in young adulthood. *Lancet*, 343: 324-327.
- Loggie, J.M., M.J. Horan, A.R. Hohn, A.B. Gruskin, J.B. Dunbar and R.J. Havlik, 1984. Juvenile hypertension: highlights of a workshop. *J. Pediatr.*, 104: 657-663.
- Loro, A.D. and C.S. Orleans, 1981. Binge eating in obesity: preliminary findings and guidelines for behavioral analysis and treatment. *Addict. Behav.*, 6: 155-166.

- Losonczy, K.G., T.B. Harris and J. Cornoni-Huntley, 1995. Does weight loss from middle age to old age explain the inverse weight mortality relation in old age? *Am. J. Epidemiol.*, 141: 312-321.
- Loube, D.I., A.A. Loube and M.M. Mitler, 1994. Weight loss for obstructive sleep apnea: the optimal therapy for obese patients. *J. Am. Diet. Assoc.*, 94: 1291-1295.
- Lundgren, H., C. Bengtsson, G. Blohme, L. Lapidus and L. Sjostrom, 1989. Adiposity and adipose tissue distribution in relation to incidence of diabetes in women: results from a prospective population study in Gothenburg, Sweden. *Int. J. Obes.*, 13: 413-423.
- Maddox, G.L., K.W. Back and W.R. Liederman, 1968. Overweight as social deviance and disability. *J. Health Soc. Behav.*, 9: 287-298.
- Manson, J.E., G.A. Colditz and M.J. Stampfer, 1990. A prospective study of obesity and risk of coronary heart disease in women. *New Engl. J. Med.*, 322: 882-889.
- Manson, J.E., D.M. Nathan, A.S. Krolewski, M.J. Stampfer, W.C. Willett and C.H.A. Hennekens, 1992. Prospective study of exercise and incidence of diabetes among US male physicians. *JAMA*, 268: 63-67.
- Manson, J.E., M.J. Stampfer, C.H. Hennekens and W.C. Willett, 1995. Body weight and longevity. A reassessment. *JAMA*, 257: 353-358.
- Mann, J.I., B. Lewis and J. Shepherd, 1988. Blood lipid concentrations and other cardiovascular risk factors: distribution, prevalence and detection in Britain. *BMJ.*, 296: 1702-1706.
- Marcus, M.D., R.R. Wing and C.G. Fairburn, 1995. Cognitive treatment of binge eating versus behavioral weight control in the treatment of binge eating disorder. *Annals of Behavioral Medicine*, 17: S090.
- Marcus, M.D., R.R. Wing and J. Hopkins, 1988. Obese binge eaters: affect, cognitions, response to behavioral weight control. *J. Consult Clin. Psychol.*, 56: 433-439.
- Martinez, M.E., E. Giovannucci and D. Spiegelman, 1996. Physical activity, body size and colorectal cancer in women. *Am. J. Epidemiol.*, 96: 146-S73.
- Medalie, J.H., C. Papier and J.B. Herman, 1974. Diabetes mellitus among 10,000 adult men. 5-year incidence and associated variables. *Isr. J. Med. Sci.*, 10: 681-697.
- Millman, R.P., C.C. Carlisle, S.T. McGarvey, S.E. Eveloff and P.D. Levinson, 1995. Body fat distribution and sleep apnea severity in women. *Chest*, 107: 362-366.
- Molinari, E., P. Ragazzoni and A. Morosin, 1997. Psychopathology in obese subjects with and without binge-eating disorder and in bulimic subjects. *Psychol. Rep.*, 80: 1327-1335.
- Mussell, M.P., J.E. Mitchell, de M. Zwaan, R.D. Crosby, H.C. Seim and S.J. Crow, 1996. Clinical characteristics associated with binge eating in obese females: a descriptive study. *Int. J. Obes. Relat. Metab. Disord.*, 20: 324-331.
- Myers, A. and J.C. Rosen, 1999. Obesity stigmatization and coping: relation to mental health symptoms, body image and self-esteem. *Int. J. Obes. Relat. Metab. Disord.*, 23: 221-30.
- O'Neil, P.M. and M.P. Jarrell, 1992. Psychological aspects of obesity and dieting. In: Wadden TA, Vanlattie TB, eds. *Treatment of the Seriously Obese Patient*. New York: Guilford Press, pp: 252-270.
- Paffenbarger, R.S., R.T. Hyde, A.L. Wing, I.M. Lee, D.L. Jung and J.B. Kampert, 1993. The association of changes in physical-activity level and other lifestyle characteristics with mortality among men. *New Engl. J. Med.*, 328: 538-545.
- Phillips, R.L. and D.A. Snowdon, 1985. Dietary relationships with fatal colorectal cancer among Seventh Day Adventists. *J. Natl. Cancer Inst.*, 74: 307-17.
- Pingitore, R., B.L. Dugoni, R.S. Tindale and B. Spring, 1994. Bias against overweight job applicants in a simulated employment interview. *J. Appl. Psychol.*, 79: 909-917.
- Prentice, A. and G. Goldberg, 1996. Maternal obesity increases congenital malformations. *Nutr. Rev.*, 54: 146-152.
- Rabkin, S.W., Y. Chen, L. Leiter, L. Liu and B.A. Reeder, 1997. Risk factor correlates of body mass index. Canadian Heart Health Surveys Research Group. *CMAJ*, 157: 26-31.
- Reeder, B.A., A. Angel, M. Ledoux, S.W. Rabkin, T.K. Young and L.E. Sweet, 1992. Obesity and its relation to cardiovascular disease risk factors in Canadian adults. Canadian Heart Health Surveys Research Group. *CMAJ*, 146: 2009-2019.
- Reeder, B.A., A. Senthilselvan, J.P. Després, A. Angel, L. Liu and H. Wang, 1997. The association of cardiovascular disease risk factors with abdominal obesity in Canada. *CMAJ*, 197: 157: 39.
- Rexrode, K.M., C.H. Hennekens and W.C. Willett, 1997. A prospective study of body mass index, weight change and risk of stroke in women. *JAMA*, 277: 1539-1545.
- Richardson, S.A., A.H. Hastorf, N. Goodman and S.M. Dornbusch, 1961. Cultural uniformity in reaction to physical disabilities. *Am. Soc. Rev.*, 26: 241-247.
- Rich-Edwards, J.W., M.B. Goldman and W.C. Willett, 1994. Adolescent body mass index and infertility caused by ovulatory disorder. *Am. J. Obstet. Gynecol.*, 171: 171-177.
- Rocchini, A.P., J. Key and D. Bondie, 1989. The effect of weight loss on the sensitivity of blood pressure to sodium in obese adolescents. *New Engl. J. Med.*, 321: 580-585.

Afridi et al.: Health Risks of Overweight and Obesity - An Over View

- Roche, A.F., 1994. Sarcopenia: a critical review of its measurements and health-related significance in the middle-aged and elderly. *Am. J. Hum. Biol.*, 6: 33-42.
- Roe, D.A. and K.R. Eickwort, 1976. Relationships between obesity and associated health factors with unemployment among low income women. *J. Am. Med. Womens Assoc.*, 31: 193-194, 198-199, 203-204.
- Sargent, J.D. and D.G. Blanchflower, 1994. Obesity and stature in adolescence and earnings in young adulthood. Analysis of a British birth cohort. *Arch. Pediatr. Adolesc. Med.*, 148: 681- 687.
- Sarlio-Lahteenkorva, S., A. Stunkard and A. Rissanen, 1995. Psychosocial factors and quality of life in obesity. *Int. J. Obes.*, 19: S1-S5.
- Schottenfeld, D. and J.F. Fraumeni, 1996. *Cancer Epidemiology and Prevention*. New York: Oxford University Press.
- Shaper, A.G., S.G. Wannamethee and M. Walker, 1997. Body weight: implications for the prevention of coronary heart disease, stroke and diabetes mellitus in a cohort study of middle aged men. *BMJ*, 314: 1311-1317.
- Shepard, J.W., 1992. Hypertension, cardiac arrhythmias, myocardial infarction and stroke in relation to obstructive sleep apnea. *Clin. Chest Med.*, 13: 437-458.
- Shimizu, M. and Y. Isogai, 1993. Heart failure due to metabolic heart disorders. *Nippon Rinsho*, 51: 1362-1366.
- Smith, D.E., C.E. Lewis, J.L. Caveny, L.L. Perkins, G.L. Burke and D.E. Bild, 1994. Longitudinal changes in adiposity associated with pregnancy. The CARDIA Study. *Coronary Artery Risk Development in Young Adults Study*. *JAMA*, 271: 1747-1751.
- Smith, P.L., A.R. Gold, D.A. Meyers, E.F. Haponik and E.R. Bleecker, 1985. Weight loss in mildly to moderately obese patients with obstructive sleep apnea. *Ann. Intern. Med.*, 103: 850-855.
- Snowdon, D.A., R.L. Phillips and W. Choi, 1982. Diet, obesity and risk of fatal prostate cancer. *Am. J. Epidemiol.*, 120: 244-50.
- Specker, S., M. de Zwaan, N. Raymond and J. Mitchell, 1994. Psychopathology in subgroups of obese women with and without binge eating disorder. *Compr Psychiatry*, 35: 185-190.
- Spitzer, R.L., M. Devlin and B.T. Walsh, 1992. Binge eating disorder: a multisite field trial of the diagnostic criteria. *Int. J. Eat Disord.*, 11: 191-203.
- Spitzer, R.L., S. Yanovski and T. Wadden, 1993. Binge eating disorder: its further validation in a multisite study. *Int. J. Eat Disord.*, 13: 137-153.
- Staffieri, J.R., 1967. A study of social stereotype of body image in children. *J. Pers Soc. Psychol.*, 7: 101-104.
- Staffieri, J.R., 1972. Body build and behavioral expectancies in young females. *Dev. Psychol.*, 6: 125-127.
- Stampfer, M.J., K.M. Maclure, G.A. Colditz, J.E. Manson and W.C. Willett, 1992. Risk of symptomatic gallstones in women with severe obesity. *Am. J. Clin. Nutr.*, 55: 652-658.
- Stevens, J., J. Cai, E.R. Pamuk, D.F. Williamson, M.J. Thun and J.L. Wood, 1998. The effect of age on the association between body-mass index and mortality. *New Engl. J. Med.*, 338: 1-7.
- Striegel-Moore, R.H., G.T. Wilson, D.E. Wilfley, K.A. Elder and K.D. Brownell, 1998. Binge eating in an obese community sample. *Int. J. Eat Disord.*, 23: 27-37.
- Stunkard, A.J. and T.A. Wadden, 1992. Psychological aspects of human obesity. In: Bjorntorp P, Brodoff BN, eds. *Obesity*. Philadelphia: Lippincott, 352-360.
- Sullivan, M., J. Karlsson and L. Sjostrom, 1993. Swedish obese subjects (SOS) an intervention study of obesity. Baseline evaluation of health and psychosocial functioning in the first 1743 subjects examined. *Int. J. Obes. Relat. Metab. Disord.*, 17: 503-512.
- Telch, C.F. and W.S. Agras, 1993. The effects of a very low-calorie diet on binge eating. *Behav. Therapy*, 24: 177-194.
- Telch, C.F., W.S. Agras and E.M. Rossiter, 1988. Binge eating increases with increasing adiposity. *Int. J. Eat Disord.*, 7: 115-119.
- Tiggemann, M. and E.D. Rothblum, 1988. Gender differences in social consequences of perceived overweight in the United States and Australia. *Sex Roles*, 18: 75-86.
- Tokunaga, K., Y. Matsuzawa and K. Kotani, 1991. Ideal body weight estimated from the body mass index with the lowest morbidity. *Int. J. Obes.*, 15: 1-5.
- Troiano, R.P., E.A. Frongillo, J. Sobal and D.A. Levitsky, 1996. The relationship between body weight and mortality: a quantitative analysis of combined information from existing studies. *Int. J. Obes. Relat. Metab. Disord.*, 20: 63-75.
- Urbina, E.M., S.S. Gidding, W. Bao, A.S. Pickoff, K. Berdusis and G.S. Berenson, 1995. Effect of body size, ponderosity and blood pressure on left ventricular growth in children and young adults in the Bogalusa Heart Study. *Circulation*, 91: 2400-2406.
- VanItallie, T.B., 1985. Health implications of overweight and obesity in the United States. *Ann. Intern. Med.*, 103: 983-988.
- VanItallie, T.B. and E.A. Lew, 1990. Overweight and Underweight. In: Lew EA, Gajewski J, eds. *Medical Risks: Trends in Mortality by Age and Timed Elapsed*. Vol 1. New York: Praeger; Chapter 13.
- Wadden, T.A. and A.J. Stunkard, 1985. Social and psychological consequences of obesity. *Ann. Intern. Med.*, 103: 1062-1067.

Afridi et al.: Health Risks of Overweight and Obesity - An Over View

- Wadden, T.A. and A.J. Stunkard, 1987. Psychopathology and obesity. *Ann. N. Y. Acad. Sci.*, 499: 55-65.
- Wadden, T.A. and A.J. Stunkard, 1993. Psychosocial consequences of obesity and dieting-research and clinical findings. In: Stunkard AJ, Wadden TA, eds. *Obesity Theory and Therapy*. New York: Raven Press, 163-177.
- Walker, S.P., E.B. Rimm, A. Ascherio, I. Kawachi, M.J. Stampfer and W.C. Willett, 1996. Body size and fat distribution as predictors of stroke among US men. *Am. J. Epidemiol.*, 144: 1143-1150.
- Wardle, J., 1996. Obesity and behaviour change: matching problems to practice. *Int. J. Obes.*, 20: 1-8.
- Westlund, K. and R. Nicolaysen, 1972. Ten-year mortality and morbidity related to serum cholesterol. A follow-up of 3,751 men aged 40-49. *Scand. J. Clin. Lab. Invest. Suppl.*, 127: 1-24.
- WHO., 1995. Physical status: the use and interpretation of anthropometry. Report of a WHO Expert Committee. *World Health Organ. Tec. Rep. Ser.*, 854: 1- 452.
- Wilcosky, T., J. Hyde, J.J.B. Anderson, S. Bangdiwala and B. Duncan, 1990. Obesity and mortality in the Lipid Research Clinics Program Follow-up Study. *J. Clin. Epidemiol.*, 43: 743-52.
- Wilfley, D.E. and L.R. Cohen, 1997. Psychological treatment of bulimia nervosa and binge eating disorder. *Psychopharmacol Bull.*, 33: 437-453.
- Wilfley, D.E., W.S. Agras and C.F. Telch, 1993. Group cognitive-behavioral therapy and group interpersonal psychotherapy for the nonpurging bulimic individual: a controlled comparison. *J. Consult Clin. Psychol.*, 61: 296-305.
- Willett, W.C., M.L. Browne and C. Bain, 1985. Relative weight and risk of breast cancer among premenopausal women. *Am. J. Epidemiol.*, 122: 731-740.
- Willett, W.C., J.E. Manson and M.J. Stampfer, 1995. Weight change and coronary heart disease in women. Risk within the 'normal' weight range. *JAMA*, 273: 461-465.
- Willett, W.C., M. Stampfer, J. Manson and T. VanItallie, 1991. New weight guidelines for Americans: justified or injudicious? *Am. J. Clin. Nutr.*, 53: 1102-1103.
- Wittels, E.H. and S. Thompson, 1990. Obstructive sleep apnea and obesity. *Otolaryngol Clin. North Am.*, 23: 751-60.
- Yanovski, S.Z., 1993. Binge eating disorder: Current knowledge and future directions. *Obes. Res.*, 1: 306-324.
- Yanovski, S.Z., J.F. Gormally, M.S. Leser, H.E. Gwirtsman and J.A. Yanovski, 1994. Binge eating disorder affects outcome of comprehensive very-low-calorie diet treatment. *Obes. Res.*, 2: 205-212.
- Yanovski, S.Z. and N.G. Sebring, 1994. Recorded food intake of obese women with binge eating disorder before and after weight loss. *Int. J. Eat Disord.*, 15: 135-150.
- Young, T., M. Palta, J. Dempsey, J. Skatrud, S. Weber and S. Badr, 1993. The occurrence of sleep-disordered breathing among middle-aged adults. *New Engl. J. Med.*, 328: 1230-1235.