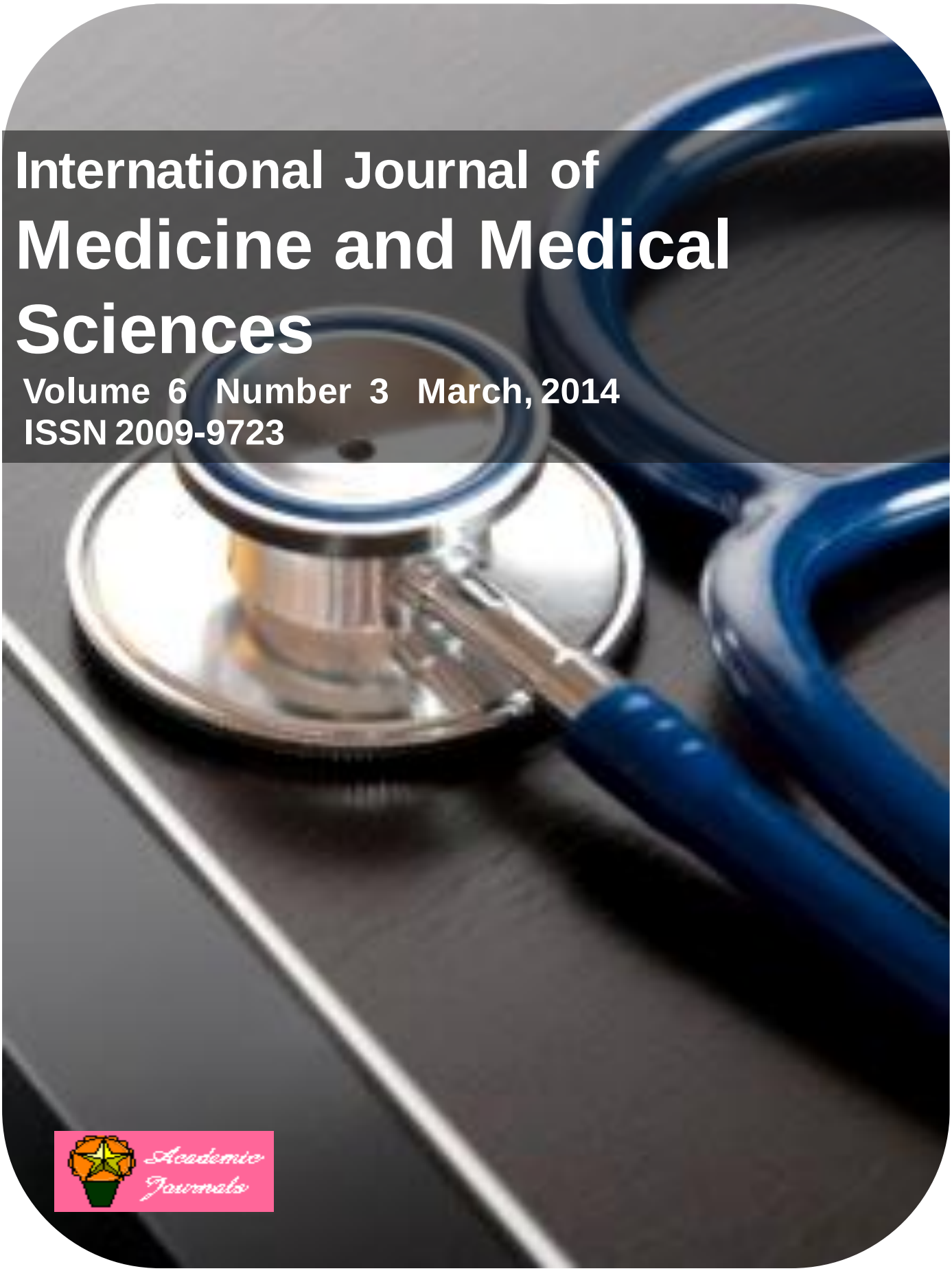

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Mussel RL, De Sa Silva E, Costa AM, Mandarim-De-Lacerda CA (2003). Mast cells in tissue response to dentistry materials: an adhesive resin, a calcium hydroxide and a glass ionomer cement. J. Cell. Mol. Med. 7:171-178.

Booth M, Bundy DA, Albonico P, Chwaya M, Alawi K (1998). Associations among multiple geohelminth infections in school children from Pemba Island. Parasitol. 116: 85-93.0.

Fransiscus RG, Long JC (1991). Variation in human nasal height and breath, Am. J. Phys. Anthropol. 85(4):419-427.

Stanislawski L, Lefeuvre M, Bourd K, Soheili-Majd E, Goldberg M, Perianin A (2003). TEGDMA-induced toxicity in human fibroblasts is associated with early and drastic glutathione depletion with subsequent production of oxygen reactive species. J. Biomed. Res. 66:476-82.

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Table of Contents: Volume 6 Number 3 March 2014

ARTICLES

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Full Length Research Paper

Histopathological study of prostatic lesions on needle biopsies with serum prostate-specific antigen (PSA)

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Prostate develops from a series of endodermal buds from the lining of primitive urethra and the adjacent portion of urogenital sinus during the first 3 months of intra-uterine life. A prostate needle biopsy is a surgical procedure in which a small sample of tissue is removed from the prostate gland and examined under the microscope by a pathologist. In all investigated individuals, the level of prostate-specific antigen (PSA) was determined in identical way. PSA was estimated in venous blood by electro-chemiluminescence method. Histopathological analysis of obtained material was done on standard hematoxylin-eosin (H&E) preparations. Out of 60 patients studied, most of the patients 30 (50%) were diagnosed with benign prostatic hyperplasia (BHP). Higher levels of PSA (>20) was found in 57.1% of patients of BHP with chronic prostatitis table 11. Out of the total number of adenocarcinoma patients, 77.8% of the patients were having preoperative PSA levels greater than 20. In our study, the positive predictive value for increasing PSA levels was 8.3% for PSA <4 ng/ml, 16.6% for PSA >4 ng/ml, 24.2% for PSA >10 ng/ml and 83.3% for PSA >100 ng/ml.

Key words: Prostate, lesions, histopathology, needle biopsies, serum prostate-specific antigen (PSA).

INTRODUCTION

Prostate develops from a series of endodermal buds from the lining of primitive urethra and the adjacent portion of urogenital sinus during first 3 months of intra-uterine life. The surrounding mesenchyme condenses to form the stroma of the gland. Prostate utricle develops in the region of mullerian tubercle similar to uterus or vagina in females. The prostate is an accessory gland of the male reproductive system. It is a firm conical fibromuscular gland and lies in the lesser pelvis below the neck of the urinary bladder behind the lower part of the pubic symphysis and the upper part of the pubic arch anterior to the rectum. The prostate consists of stromal and glandular components. Smooth muscle cells, fibroblasts and endothelial cells are in the stroma. The glandular component is composed of acini and ducts. Both acini and ducts contain secretory cells, basal cells and neuroendocrine cells. The columnar secretory cells, stain positively with prostate specific antigen and prostatic acid phosphatase (Epstein, 1997). Basal cells are less differentiated than secretory cells and so are devoid of secretory products such as prostate-specific antigen (PSA) (Warhol and Longtine, 1985). The prostate has the greatest number of neuroendocrine cells of any of the genitourinary organs (Di Sant'Agnese, 1992). Glands are structured with open and closed cell types with the open type facing the inside of the duct having a monitoring role

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Table 1. Histopathological diagnosis of patients (N=60).

Diagnosis	N	%
BHP	30	50
Adenocarcinoma	09	15
BHP with chronic prostatitis	07	11.6
BHP with basal cell hyperplasia	02	3.3
PIN	04	6.6
Chronic granulomatous prostatitis	01	1.6
Atypical suspicious of malignancy	01	1.6
Inadequate	06	10

Table 2. PSA in patients with BHP (N=30).

PSA (ng/ml)	N	%
<4	11	36.6
4 to 10	09	30
10.1 to 20	07	23.3
>20	03	10

95% CI of difference, P = 0.00677.

over its contents. Most cells contain serotonin, but other peptides present include somatostatin, calcitonin, gene-related peptides and katacalcin (Epstein, 1997). The cells co-express PSA and prostatic acid phosphatase. Their function is unclear but it is speculated that these cells are involved with local regulation by paracrine release of peptides (Epstein, 1997). Prostatic ducts and acini are distinguished by architectural pattern at low power magnification. The prostate becomes more complex with ducts and branching glands arranged in lobules and surrounded by stroma with advancing age.

A prostate needle biopsy is a surgical procedure in which a small sample of tissue is removed from the prostate gland and examined under the microscope by a pathologist. Prostate needle biopsy may be performed either transrectal ultrasound (TRUS) guided or by transrectal or transurethral routes. Needle biopsy of the prostate plays a central role in the evaluation of prostate cancer. The main aims and objectives of the study to be undertaken were to study the histopathology of prostatic needle biopsies for diagnosing various prostatic lesions, to correlate the histopathological findings with preoperative serum PSA levels for confirmation of diagnosis in cases with diagnostic dilemma. The present study was conducted from May 2009 to May 2010 in the Department of Pathology, Government Medical College, Srinagar, in collaboration with the Department of Surgery. This study was conducted on 60 patients present with abnormal digital rectal examination (DRE) or elevated serum PSA of >4 ng/ml or both abnormal DRE and elevated serum PSA.

MATERIALS AND METHODS

A detailed history of every patient with particular reference to age, presenting complaints of obstructive voiding such as hesitancy, poor flow, intermittent stream, dribbling, sensation of poor bladder emptying, episodes of retention and irritative symptoms like frequency, nocturia, urgency, urge incontinence and abnormality on DRE were recorded. All patients underwent thorough general physical examination, abdominal examination including genito-urinary examination.

PSA determination

In all investigated individuals, the level of PSA was determined in identical way. PSA was estimated in venous blood by sandwich electro-chemiluminescence method that employs a biotinylated monoclonal PSA specific antibody and a monoclonal PSA specific antibody labeled with ruthenium complex. PSA in the specimen reacts with both the antibodies forming the sandwich complex. Streptaviden coated micro particles are added and the mixture is aspirated into the measuring cell where the microparticles are captured onto the surface of electrode. Unbound substances are then removed with procell. Application of voltage to the electrode induces the chemiluminescent emission which is then measured against a calibration curve to determine the amount of PSA in the patient's specimen.

There was no immediate manipulation on prostate (DRE, prostate massage, endoscopic examination) before taking a blood sample for PSA.

Indications for biopsy

The biopsy was performed with "Tru-cut" needle using transrectal or transperineal approach with previous preparing of patient (purgation and antibiotic protection). The indications for biopsy were an abnormal DRE suspicious of malignancy and/or high serum PSA values.

Histopathological analysis

Histopathological analysis of obtained material was done on standard hematoxylin-eosin (H&E) preparations. Fixation of tissue samples has been done in 10% formaldehyde solution for 24 h. The tissue was processed routinely in an automatic tissue processor. Blocks were prepared and the sections cut on microtom to the thickness of 4 microns. The sections were then stained routinely by H&E method and examined under microscope. Histopathologic diagnosis was made as benign prostatic hyperplasia (BHP), chronic prostatitis, basal cell hyperplasia, prostatic intraepithelial neoplasia (PIN), adenocarcinoma and atypical suspicious of malignancy. Gleason's grading was done in the adenocarcinoma patients. The histopathological results were correlated with preoperative serum PSA levels and clinical features.

All the data was subjected to statistical analysis by simple interactive statistical analysis (SISA).

Observation

Out of 60 patients studied, most of the patients 30 (50%) were diagnosed with BHP. Out of 60 patients studied, lesser number of patients were diagnosed with chronic granulomatous prostatitis (1.6%) and atypical suspicious of malignancy (1.6%). Out of the 4 patients diagnosed as PIN, 3 were having high grade PIN and 1 was diagnosed as low grade PIN (Table 1). The higher level of PSA (>4) was recorded in nineteen (19) patients out of 30 patients which were diagnosed with BHP (Table 2). Out of the total number of

Table 3. PSA in patients with adenocarcinoma (N=09).

PSA (ng/ml)	N	%
<4	01	11.1
4 to 10	0	0
10.1 to 20	01	11.1
>20	07	77.8

Median 200 (Range 3.15 to 4240), 95% CI, P = 0.0001.

Table 4. PSA in patients of BHP with chronic prostatitis (N=07).

PSA (ng/ml)	N	%
<4	01	14.3
4 to 10	01	14.3
10.1 to 20	01	14.3
>20	04	57.1

Mean 28.3.

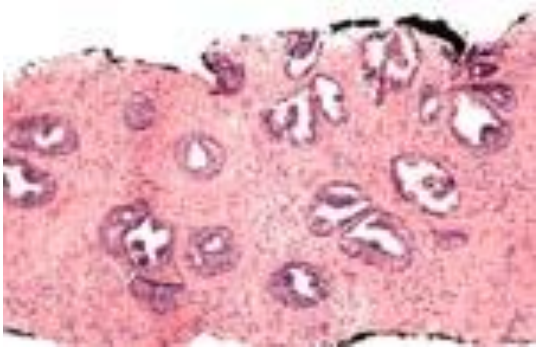

Figure 1. Benign prostatic hyperplasia with basal cell hyperplasia (10×).

adenocarcinoma patients, 77.8% of the patients were having preoperative PSA levels greater than 20 (Table 3). Higher levels of PSA (>20) was found in 57.1% of patients of BHP with chronic prostatitis (Table 4).

DISCUSSION

Prostatic cancer among adult males is the most common neoplasm in most developed countries. It has been estimated that over 200,000 men in United States are diagnosed annually with prostate cancer and 300,000 men still die from this disease each year. The age-standardized incidence of prostate cancer in the European Union (EU) is 65/100,000 and the EU mortality rate is 26/100,000 per year (Brauer). Prostate cancer incidence is increasing in India. Currently, it ranks 5th in incidence and 4th in mortality for men in Mumbai (Farnswork 1973). Prostatic carcinomas can be divided into two major categories: (1) adenocarcinoma of peripheral (secondary) ducts and acini and (2) carcinoma of large (primary) duct. There are three different growth patterns of prostatic carcinoma: glandular, cribriform and solid-undifferentiated. The prognosis of prostate carcinoma depends largely on the degree of differentiation. Therefore, the pathologist plays an important part in diagnosis and therapeutic decisions (Foster and Deshmukh, 1992).

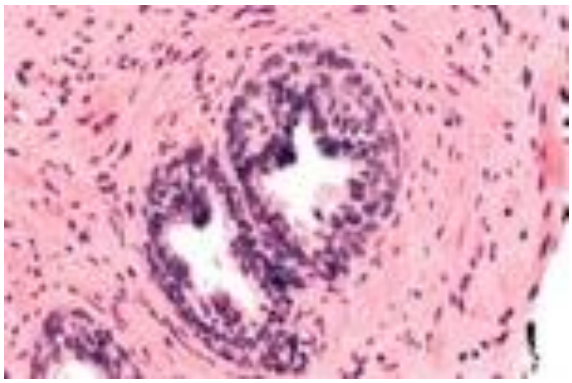

Figure 2. Basal cell hyperplasia (40×).

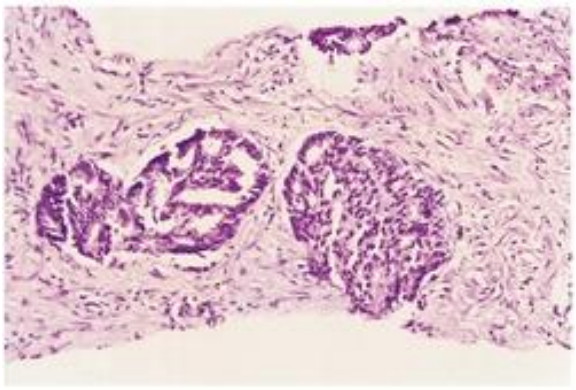

Figure 3. High grade prostatic intraepithelial neoplasia (PIN; 40×).

Out of 60 patients, 30 (50%) patients were diagnosed as benign prostatic hyperplasia (BPH) (Figures 4 and 5), 7 (11.6%) patients were diagnosed as BHP with chronic prostatitis, 2 (3.3%) were diagnosed as BHP with basal cell hyperplasia (Figures 1 and 2), 9 (15%) were diagnosed as adenocarcinoma (Figures 6, 7 and 8), 4 (6.6%) were diagnosed as prostatic intraepithelial neoplasia (PIN) (Figure 3) and 1 (1.6%) was diagnosed as chronic granulomatous prostatitis (Figure 5). Out of 60 patients, 6 (10%) patients had an inadequate biopsy material on histopathological examination and 1 (1.6%) patient was having atypical glands suspicious of adenocarcinoma. These results were nearly comparable with the studies conducted by Gupta et al. (2005) and Iczkowski et al. (1998) Mean age of the patients was 64.8 years and mean serum PSA was 120.5 n/ml.

Figure 4. Benign prostatic hyperplasia showing corpora amylacea (40×).

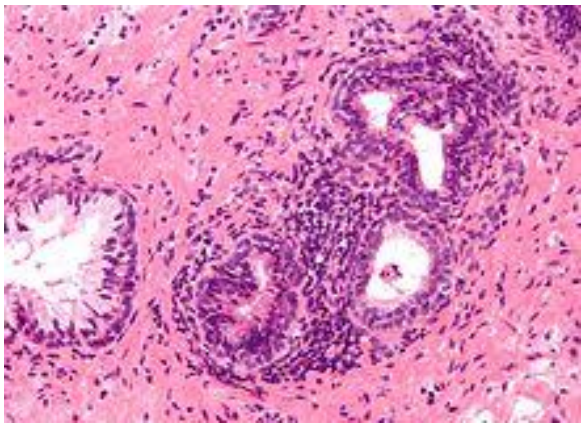

Figure 5. Benign prostatic hyperplasia with chronic prostatitis (40×).

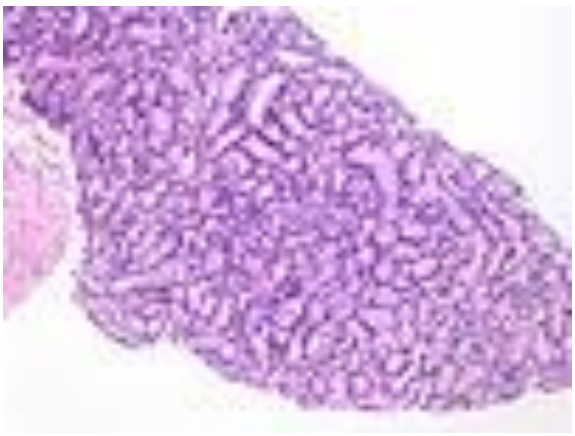

Figure 6. Prostatic adenocarcinoma (Gleason's pattern 4; 10×).

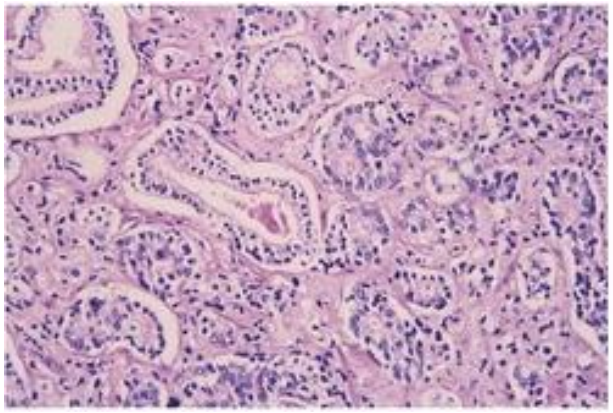

Figure 7. Prostatic adenocarcinoma (Gleasons pattern 3 & 4; 40×).

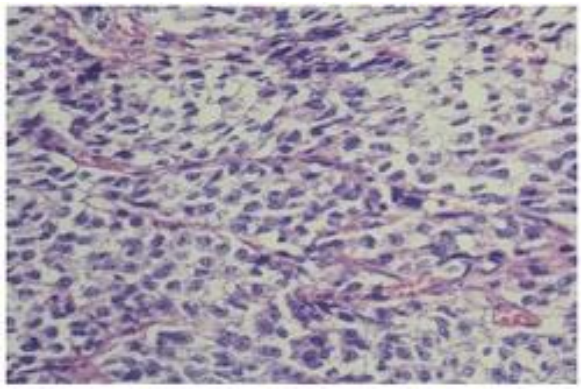

Figure 8. Prostatic adenocarcinoma (Gleasons pattern 5; 40×).

In patients with BHP, 11 (36.6%) had serum PSA of less than 4 ng/ml, 9 (30%) had serum PSA in the range of 4 to 10 ng/m and 10 (33.3%) patients had serum PSA more than 10 ng/ml. Mean serum PSA was 8.9 ng/ml. Our results were comparable with the studies conducted by Ferro et al. (1987) and Amayo and Obara (2004).

Almost all patients (89%) with adenocarcinoma had raised serum PSA of more than 10 ng/ml, only one patient (11%) was having a serum PSA of less than 4 ng/ml. Mean serum PSA was 703.95 ng/ml. Median PSA was 200 ng/ml (range 3.15 to 4240 ng/ml). This study revealed a statistically significant correlation between serum PSA and adenocarcinoma. These findings were consistent with the study conducted by Berman et al. (1994)

In this study, the positive predictive value for increasing PSA levels was 8.3% for PSA <4 ng/ml, 16.6% for PSA >4 ng/ml, 24.2% for PSA >10 ng/ml and 83.3% for PSA >100 ng/ml. In this study, the detection rate of prostate cancer in patients with serum PSA between 3 and 4 ng/ml was 14%. These findings were consistent with the study conducted by Aus (1998).

Our study revealed a PSA value of >4 ng/ml in men of 50 years age or older was associated with 20% chance of

detecting prostate cancer on the initial diagnostic biopsy. These interpretations were not comparable with the study conducted by Catalona et al. (1998) and this may be due to smaller number of patients in the study.

In the study, 22 patients present with acute urinary retention and had raised PSA values. Out of these, only 6 (22%) were positive for adenocarcinoma, which raised the false positive rate of PSA as a method for detecting carcinoma. It was concluded that acute urinary retention is associated with raised PSA levels. These findings were comparable with the studies conducted by McNeal (1978) and Chawla et al. (2003)

In the study, there was a statistically significant correlation between serum PSA and prostatomegaly. With increase in prostate size, serum PSA was also increasing, and there was also statistically significant correlation between serum PSA and histological inflammation in the prostate. These interpretations were comparable with the studies conducted by Okada et al. (2000).

In patients with BHP, 11 (36.6%) had serum PSA of less than 4 ng/ml, 9 (30%) had serum PSA in the range of 4 to 10 ng/m and 10 (33.3%) patients had serum PSA more than 10 ng/ml. Mean serum PSA was 8.9 ng/ml and almost all patients (89%) with adenocarcinoma had raised serum PSA of more than 10 ng/ml, only one patient (11%) was having a serum PSA of less than 4 ng/ml. Mean serum PSA was 703.95 ng/ml. Median PSA was 200 ng/ml (range 3.15 to 4240 ng/ml).

This study revealed that no level of PSA was associated with a 100% positive predictive value and negative biopsy can occur virtually at any PSA level.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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Full Length Research Paper

Correlates of sexual outcome expectations and risk of sexually transmitted infections (STIs) among male inmates in the United States

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This study sought to identify variables that independently correlate with sexual outcome expectations among a sample of 187 convicted felons in Georgia. Trained interviewers collected data from study participants after explaining the purpose of the study and obtaining informed consent. Relationships between individual sexual outcome expectation variables and other demographics were examined using multiple linear regression models. Models specified self-reported sexual outcome expectation regarding a given infectious disease risk as an outcome with selected variables. Respondents' age was a predictor of using condoms each time they had sex (Beta = 0.15, P < 0.04) and limiting the number of sex partners (Beta = 0.19, P < 0.008). Incarceration history (first time versus prior incarceration) was significantly associated with using and/or requesting that their partners use condoms each time they had sex (p < 0.03), and being able to ask partners about their sexual history (p < 0.03). Our findings imply that interventions to prevent infectious diseases among inmates should address education and illicit substances specifically in sexual situations so as to better understand the nature of risk practices and sexual behavior among this group.

Key words: Outcome expectations, human immunodeficiency virus (HIV) risk, inmates, sex.

INTRODUCTION

Infectious diseases and sexually transmitted infections (STIs) are both expensive and principal public health problems in the United States and are even more so among incarcerated populations (Lang and Belenko, 2001; Harris et al., 2002; Narevic et al., 2006; Stephens et al., 2002). Nationally, rates of human immunodeficiency virus (HIV), tuberculosis (TB) and heppitatus C (HCV) are greater for incarcerated populations than the general community (Bruneau et al., 2001; Mullings et al., 2003; Dolan et al., 2005). Specifically, rates of STIs are substantially higher in prison populations than in the public worldwide (Massad et al., 1999; Clarke et al., 2001).

Many of these studies that examine inmate populations and psychosocial and behavioral constructs tend to look at overt behaviors. Lang and Belenko (2001) found among other factors, that age, physical abuse history, anxiety, family problems and poly-substance use were predictive of sex-related HIV risk. Incarcerated populations tend to have multiple HIV risk behaviors.

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These include having a relatively high lifetime number of sexual partners, limited condom use and having sex under the influence of drugs and alcohol (Bruneau et al., 2001; Belenko et al., 2005; Stephens et al., 2004; Johnson et al., 2004; Narevic et al., 2006).

Theoretical frame work

Rooted in social cognitive theory, the concept of outcome expectation is an important component of health-related behavioral change. According to this theory, outcome expectations may be shaped by social norms, knowledge, and self-efficacy (Bandura, 1977; DiIorio et al., 2006). Previous studies of HIV risk behaviors and sexual health have consistently shown that low outcome expectations are strong predictors of behaviors that increase risk for infectious disease among adults with mental illness (Kelly et al., 1995), heterosexual adult female STD patients (Thompson et al., 1997) and heterosexual adult males (Bengel et al., 1996).

Little is known about outcome expectations related to sexual practices among inmates and how they may differ by sociodemographic factors unique to inmate populations. In addition, few data on sexual outcome expectation among inmate populations exist; yet, this population is at particularly high risk for infectious diseases, including STIs. What is documented is that sexual self expectation is a predictor of HIV risk among inmate populations and can be impacted positively with peer-based interventions (Braithwaite et al., 2005). Thus, the objectives of this study were to estimate independent correlates of sexual outcome expectations with respect to infectious disease risk behaviors of a sample of male inmates in Georgia and to identify inmate characteristics associated with these psychosocial outcomes.

METHODOLOGY

Study site and sample

This study collected data from adult male inmates in Georgia, USA. Baseline level data was collected after the identification of a pool of eligible participants by the Department of Correction's Personnel. Inmates had to be between 60 and 90 days prior to release from the facility, returning to the metropolitan Atlanta area (this criterion would make follow up more feasible), 18 years of age or older, and male to be eligible for inclusion. The participants were recruited from a population housed at three medium security correctional institutions for men located in middle Georgia and a transitional center located in a major southeastern city.

Data collection

Trained interviewers collected data from study participants after explaining the purpose of the study and obtaining informed consent. The interviewer provided an overview of the major areas to be covered with the data collection instrument to each participant to make certain that they understood the response format. The instrument was written on a fourth grade reading level.

Participants were 187 adult male inmates recruited from three medium security prisons and one Area Transition Center in Georgia. The ages of participants ranged from 18 to 59 years (M = 35.3, SD = 8.9) with the majority of the participants (126 = 67.4%) being African American. Although nearly half (87 = 46.28%) had been incarcerated prior to the current incarceration, the mean total lifetime years incarcerated was 9.17 (SD = 15.4).

Analysis

Relationships between individual sexual outcome expectation variables and other demographics were examined using multiple linear regression models. All models specified self-reported sexual expectation regarding a given infectious disease risk as an outcome with selected demographic variables (race, age, education, income prior to incarceration, length of incarceration, first time incarceration and total years incarcerated) as predictor variables. All measures were entered independently into the estimated equations.

Measures

Participants were asked to provide descriptive and scale information on several variables using standard response formats. Socio-demographic variables on the data collection instrument included: ethnicity, marital status, educational level, income prior to incarceration, and incarceration history. Several individual items represented incarceration status. Length of incarceration was an open ended item that asked participants to write the total years served during their recent incarceration. Prior or first time incarceration was measured with a dichotomous response item worded: "Was this your first time being incarcerated?"

A measure of sexual outcome expectations was obtained by asking individuals eight items about "how confident are you that you will be able to do the following activities when you are released from prison?" Example items included "Using a condom or request that your partner use them every time you have sex"; "limiting the number of sexual partners you have"; "engaging in sexual activity after using marijuana"; and "asking your partner whether they have a sexually transmitted infection (that is, herpes, syphilis)." Responses were measured on a 100-point Likert-type scale from (0) "not at all confident" to (100) "very confident". Cronbach's alpha coefficient for the eight items was 78.

RESULTS

Table 1 presents results of the linear regression analysis that examined whether the selected demographic variables and attributes of incarceration were associated with self-reported sexual outcome expectation among inmates prior to their current incarceration. As shown, race, age, and first time incarceration were significantly predicted and associated with inmate's ability to use and/or request that they use a condom every time during sex. Total years' incarceration was almost significantly associated with variable ($p < 0.06$). Race was not significantly correlated with any of the other independent sexual self-expectation outcomes; however, it was almost associated with inmate's propensity to engage in sexually activity ex post facto drinking ($p < 0.08$).

Respondents' age was a predictor of using condoms each time they had sex (Beta = 0.15, $P < 0.04$) and limiting the number of sex partners (Beta = 0.19, $P < 0.008$). Age was nearly predictive of inmates being able to

Table 1. Relations between sexual outcome expectations and selected variables.

Parameter	Use/Request use of condoms every time			Limit number of sex partners			Request partner HIV status			Discuss with partner safer sexual behavior		
	B	t	p	B	t	p	B	t	p	B	t	p
Race	-0.24	-3.38	0.001	-0.11	-1.42	0.15	-0.10	-1.32	0.18	-0.06	-0.87	0. 38
Age	0.15	2.07	0.04	0.19	2.68	0.008	0.11	1.44	0.15	0.13	1.84	0.06
Education	-0.05	-0.74	0.45	-0.02	0.25	0.79	-0.01	-0.15	0.87	-0.13	-1.75	0.08
Income	-0.08	-1.12	0.26	-0.10	-1.38	0.17	-0.02	-0.38	0.70	-0.07	-0.97	0.33
Length incarcerated	0.06	0.82	0.41	0.05	0.76	0.44	0.08	1.08	0.28	0.02	0.33	0.73
1st Time incarcerated	0.15	2.10	0.03	0.12	1.64	0.10	0.05	0.72	0.47	0.14	1.81	0.07
Total years incarcerated	0.13	1.84	0.06	-0.14	-1.87	0.06	0.09	1.22	0.22	0.08	1.01	0.27

Parameter	Engage sexual activity after drinking			Engage sexual activity after using marijuana			Ask partners if they have STDs			Ask about sexual history prior to sex		
	B	t	p	B	t	p	B	t	p	B	t	p
Race	0.13	1.71	0.08	0.06	0.87	0.38	-0.04	0.64	0.51	-0.11	-1.47	0.14
Age	-0.07	-1.01	0.31	-0.13	-1.74	0.08	0.02	6.25	0.79	-0.11	1.55	0.12
Education	0.01	0.014	0.88	-0.05	-0.74	0.44	-0.07	-1.04	0.30	-0.05	0.069	0.48
Income	-0.03	-0.43	0.66	-0.09	-1.22	0.22	0.04	0.65	0.51	-0.06	-0.79	0.427
Length Incarcerated	-0.09	-1.30	0.19	-0.08	-1.15	0.24	0.06	0.81	0.41	0.01	0.14	0.88
1st Time Incarcerated	0.07	0.36	0.71	0.06	0.84	0.40	0.13	1.69	0.09	0.16	2.17	0.03
Total Years Incarcerated	49	0.64	0.51	0.08	1.14	0.25	0.11	1.48	0.13	0.03	0.45	0.64

discuss safe sex practices with their partners ($p < 0.06$) and when engaging in sexual activity after using marijuana ($p < 0.08$). In addition, participant education approached significance and was inversely associated with inmates being able to discuss safe sex practices with their partner(s) ($p < 0.08$).

Incarceration history (first time versus prior incarceration) was significantly associated with using and/or requesting that their partners use condoms each time they had sex ($p < 0.03$), and being able to ask partners about their sexual history ($p < 0.03$). This variable approached significance for discussing safer sex practices with their partners ($p < 0.07$) and asking their partners if they have or have had an STI ($p < 0.09$).

DISCUSSION

In this cohort of inmate's, several variables including race, age and incarceration history were associated with several individual outcome expectations related to sexual risk practices. Of note was that education, albeit not a significant correlate of any of the individual outcome expectations for this sample changed the direction of the sample distribution below the median with the exception of "engaging in sexual activity after drinking." Thus, the more education the more inmates believed they could perform the afore-mentioned activities unless it was regarding behaviors under the influence of alcohol. This is not unusual since education has been considered a protective factor for a host of health risks related to infectious disease (Kral et al., 2001; Stephens et al., 2005). Income was also observed to be inversely associated with multiple outcome expectations with the exception of "asking one's partner about their history of STIs.

It is difficult to compare study findings to prior research on the construct in particular with respect

to incarcerated populations. What was observed from the research, especially in the area of dietary behavior change and physical activity, was that outcome expectations can be instrumental in producing self-efficacious health behaviors (Clark and Dodge, 1999; Tercyak and Tyc, 2006; Baranowski et al., 1999). In addition, the impact of education on HIV risk as documented in this study has been presented in other studies related to predictors of HIV risk (Kral et al., 2001; Moore et al., 1999; Srinivas et al., 2000).

Thus, true primary prevention with regards to this population in terms of sexual outcome expectations and their association with HIV risk practices would entail targeting education, specifically keeping potential inmates from ever entering the prison system. This means that focusing on education, staying in school and overall academic performance can be a resilient factor that reduces both the likelihood of being incarcerated, as well as enhancing individuals ability to reduce risk based on risk outcome expectations related to sex.

One limitation of this study is the possible bias associated with asking an inmate to project future behaviors when released from prison as well as the reliability of self-reported data. Future research should incorporate other measures of sexual outcome expectations such as specific negotiation skills under the influence of other elicit substances such as ecstasy and heroin. Nonetheless, our position is that sexual outcome expectations can provide valuable insight into how well inmate populations adapt and are amenable to infectious disease risk reduction interventions.

This study was also limited by the selectivity of the sample (inmates from three prisons in middle Georgia and one area transition center), with the majority of the participants being African American. Another major problem with the study was that sexual outcome expectation measures were derived from measures used with adolescent and college samples and based on self-report. Finally, it is possible that social desirability response biases exerted an influence on the findings. Despite these limitations, this study is an important first step to developing a reliable understanding regarding outcome expectations related to STI risk practices among inmate populations. Strengthening outcome expectations related to STI risk reduction and thereby increasing self-efficacious health practices can improve overall health and ultimately the quality of life for inmates, since they will eventually be returned to the community from which they came.

In conclusion, this study employed linear regression models to examine relationships between sociodemographic variables and sexual outcome expectations among a sample of male inmates. The findings of this study imply that interventions to prevent STIs among inmates should address their use of illicit substances, specifically in sexual situations, so as to better understand the nature of risk practices and sexual behavior among this group.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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Risk factors of non-communicable diseases among female university students of the Health Colleges of Taif University

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Two-thirds of 2010 deaths worldwide were caused by non-communicable diseases (NCDs), with cardiovascular diseases, hypertension and diabetes mellitus coming top as the causes of mortality. In 2008, 26.6 per 1000 female population deaths, and 46 per 1000 male population deaths in Saudi Arabia were attributed to non-communicable diseases. Data about the magnitude of NCDs among young population in the Kingdom of Saudi Arabia (KSA) are scarce. The aim of this study was to assess the prevalence of risk factors of non-conmmunicable diseases among female university students. Total coverage was carried out and a cross sectional study was done using the Arabic version of the The WHO STEPwise approach to surveillance (WHO STEPs) approach. The study showed that 3.1% of the students were current smokers, 61.7% were physically inactive; most of the students were not consuming adequate amounts of fruits and vegetables. The prevalence of overweight, mild obesity and sever obesity among the students was (28.6, 15 and 3.1%, respectively). 2.5% of the students had unacceptable fasting blood glucose level, 31.1% had unacceptable fasting blood cholesterol level and 33.6% had unacceptable fasting blood triglycerides. A significant negative correlation was found between the body mass index (BMI) and the actual metabolic equivalents of task (MET) minutes of physical exercises. And a significant positive correlation was found between the BMI and blood cholesterol and triglycerides levels, waist circumference and the waist hip ratio. The study emphasises on the importance of implementing awareness programmes on non-communicable diseases among young Saudi population to adopt healthy life styles.

Key words: Risk factors, non-communicable diseases, female university students, health colleges, Taif.

INTRODUCTION

Non-communicable diseases (NCDs) are a group of diseases accounting for millions of deaths globally each

year (Zyl et al., 2010). Two-thirds of the 52·8 million deaths worldwide in 2010 were caused by these diseases, with ischaemic heart disease, stroke, chronic obstructive pulmonary disease, lung cancer, and diabetes ranking among the top ten causes (Lozano et al., 2010). The most important risk factors for these diseases are high blood pressure, high concentration of cholesterol, inadequate intake of fruits and vegetables, overweight and obesity, physical inactivity and tobacco use (WHO, 2010 a). The World Health Organization (WHO) projected that by 2015, NCDs will account for over 70% of all deaths globally with 80% of these deaths occurring in developing countries (WHO, 2005). Studies have stated that the prevalence of risk factors for non- communicable diseases in adolescence results in a significant tendency towards development of disease in adulthood. Thus, adolescence is the appropriate period for proper intervention (Aboul Ell et al., 2011).

In Saudi Arabia, there is a recent epidemic of non-communicable diseases (Al-Nozha et al., 2004). The increase in the prevalence of these lifestyle-related diseases in Saudi Arabia is attributed to decreased physical activity and changes in dietary patterns (Al-Hazzaa, 2004). As at 2008, 26.6 per 1000 female population deaths and 46 per 1000 male population deaths in Saudi Arabia were attributed to NCDs (WHO, 2011). Prevention of NCDs has always been better than cure due to the slow manifestation of symptoms and the irreversibility of most of these diseases (Saudi Arabia Ministry of Health, 2005). In any community, this prevention depends on controlling the predisposing risk factors (Al-Nozha, 2007a), and identifying the risk-factor profile for that community (Zyl et al., 2010). Data about the magnitude of NCDs and its risk factors among young population in the KSA are scarce, that is why this study was carried out to assess the prevalence of risk factors of NCD among a sample of female university students.

METHODOLOGY

Study design and sampling

This study was a cross sectional study carried out in Taif city, in the Kingdom of Saudi Arabia (KSA). The target population was all female university students of the three health colleges (Medicine, Pharmacy and Applied Medical Sciences) of Taif University. A total of 263 students were studying in different levels in these faculties during the study period. Total coverage was carried out and all students were invited to participate in the study. The study was in the context of time frame from March to June, 2012. The purpose of the study was explained to the students and verbal and written consents were soughed. The response rate was 86.31%, and a total of 227 students constituted the subjects of the study. Participants were consented to fill the questionnaire and only 119 of them agreed to donate blood samples for analysis.

Study tool

The Arabic version of the WHO STEPs approach was adopted. It uses three steps of chronic disease risk factors assessment (WHO STEPs instrument). Step (1): Collecting information via a pre-designed questionnaire on age, marital status, average household income, family history of chronic non-communicable diseases (diabetes, hypertension and obesity), pattern of physical activity and diet. Medical and health history component included questions on cigarette use, diabetes mellitus and hypertension. Step (2): Measurement of participants' blood pressure and anthropometrical measurements which included height, weight, hip and waist circumferences, and *Step* (3): the analysis of participant's blood samples for fasting blood glucose, fasting total cholesterol and triglycerides levels.

Ethical points

Official approvals were obtained from the ethics committee of the Taif University, and from the vice dean of the college of applied medical sciences. Verbal and written consents were obtained from all the respondent students before participating in the study.

Procedure

Participants were involved in the study for two settings: the first was for completing the questionnaire (conducted by the researchers), measuring blood pressure and anthropometric measurements (carried out by the nurse in the medical clinic of the college of applied medical sciences), and the second was for collection of blood samples.

Collected variables

Current daily smokers were defined as those who mentioned smoking at least one cigarette per day, and non-smokers were defined as those who currently do not smoke cigarettes or were never smokers (Centre for Disease Control and Prevention, 2010). Physical activity was measured by applying the section on leisure-time activity from the long version of the International Physical Activity Questionnaire (IPAQ) (International Physical Activity Questionnaire 1 (IPAQ) Research Committee, 2005). Students were asked questions to recall all physical activities they had performed during the previous week, where the student was classified as sedentary when she practiced less than 150 min of physical activity in a normal week (Craig et al., 2003).

Waist and hip circumferences were measured according to the WHO guidelines, where measurements were taken to the nearest 0.1 cm (WHO, 2008). The waist-to-hip ratio was estimated by dividing waist by hip measurements, and a value ≥ 0.8 was considered as central obesity (WHO, 2008). Weight and height were measured while the student was without shoes and wearing light clothes (which is the college uniform), the weight was measured to the nearest 10 g with a digital physician weighing scale, and a height measuring rod attached to the digital scale. The participant's body mass index (BMI) was calculated as follows: (BMI = the weight in kilograms divided by the height in meters squared), and she was considered as underweight if her BMI is less than 18.5 kg/m^2; normal if BMI = 18.5 to 24.99 kg/m^2; overweight if BMI = 25 to 29.99 kg/m^2; having mild obesity if BMI = 30 to 34.99 kg/m^2; and having severe obesity if BMI > 35 kg/m^2 (Alberti et al., 2008).

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Table 1. Distribution of the health colleges's students according to their socio-demographic characteristics.

Characters	University students (n=227)	
	No.	%
Health Colleges		
Medicine	119	52.4
Pharmacy	59	26.0
Applied Medical Sciences	49	21.6
Total family income per month in Saudi Riyals		
< 5000 S.R	14	6.2
5000≤10000 S.R.	61	26.9
≥10000 S.R	152	67.0
Family history of non-communicable disease		
No history	152	67
History of obesity	53	23.3
History of diabetes	13	5.7
History of hypertension	9	4
History of diabetes and obesity	7	3.1
History of hypertension and obesity	4	1.8
History of diabetes, obesity and hypertension	2	0.9
Overall history of obesity	66	29.1
Mean ± SD of age of the participants (Years)	19.8±1.32	
Mean number ± SD of people older than 18 years, including the participant, live in her household	6.33±1.77	

Blood pressure (BP) of each participant was measured using an electronic sphygmomanometer. Two measurements were taken and the average was recorded. Systolic and diastolic BP were classified as normal, prehypertension, Stage 1 and Stage 2 hypertension (Chobanianet al., 2004). BP was classified as follows: normal < 120 mm Hg systolic and < 80 mm Hg diastolic; prehypertension: 120 to 139 mm Hg systolic or 80 to 89 mm Hg diastolic; hypertension if systolic blood pressure was at least 140 mm Hg, her diastolic blood pressure was at least 90 mm Hg, or if she was currently on anti-hypertension medication (Whitworth, 2003; Chobanian, 2003).

Blood samples were taken for biochemical assessment. For blood samples the study respondents were asked to fast overnight and not consume any food except for clear water after supper/dinner until giving the blood samples in the college clinic in the morning of the following day. Blood samples were centrifuged and serum was obtained for the analysis of the different biochemical parameters. The lipid profile and fasting blood glucose were measured by automated chemistry analyzer (Cobas 6000/C501), with photometric principle.

Diagnosis of diabetes was based on the international criteria recommended by WHO and the Committee on the Diagnosis and Classification of Diabetes Mellitus: fasting blood glucose concentration ≥ 126 mg/dl (Alberti and Zimmet, 1998). The presence of dyslipidemia was defined as: total cholesterol (TC) ≥ 200 mg/dl or triglycerides (TG) ≥ 150 mg/dl (National Cholesterol Education Program (NCEP), 2001). After the reports of the blood analysis were obtained, the students were informed individually about their BP, BMI and laboratory results and advised accordingly.

Statistical analysis

Data were stored on a daily basis using statistical package for social sciences (SPSS), version 16. The qualitative data was expressed as numbers and percentages, and the Fisher's exact test was applied to test the relationship between variables. Quantitative data was expressed as mean and standard deviation (Mean ± SD), and the Spearman correlation test was applied to test the relationship between variables. A p-value of < 0.05 was considered statistically significant.

RESULTS

Table 1 shows that 52.4% of the participant students were from the college of medicine, 26% were from the college of pharmacy and 21.6% were from the college of applied medical sciences. The mean age of the participant students was 19.8 ± 1.32 years, and all of them were unmarried. According to the smoking habits, Table 2 shows that 3.1% of the students were current smoker, of which 42.9% were daily smokers. The only reported type of smoke used was cigarette smoking and the mean number of cigarettes smoked daily was 2.71 ± 0.48 cigarette. About one third (31.7%) of the students reported to have a family member who is a smoker. Table 3 shows an observed high prevalence (61.7%) of physical inactivity among students. In addition, 43.6% were watching TV and 49.3% of the students were using the computer for more than 14 h per week. Only 25.1 and 40.5% of them consumed adequate amounts of fruits and vegetables per week.

Table 4 shows that 28.6% were overweight, 15% had

Table 2. Distribution of the female health colleges's students according to their smoking habits.

Characters	Health colleges students (n=227)	
	No.	%
Number of current smokers	7	3.1
Current daily smoking		
Yes	3	42.9
No	4	57.1
Number of ex- smokers	8	3.5
Presence of a smoking family member		
Yes	72	31.7
No	155	68.3
The mean age of starting smoking ± SD (Years)	16±1.15	
Mean number of years being a smoker ±SD (Years)	2.85±1.21	
Mean number of cigarettes smoked daily ± SD	2.71±0.48	
Mean number of days in the past week a family members smoked beside the participant ± SD	5.2±1.59	
For the ex-smokers (n=8)		
Mean age of quitting±SD (years)	17.25±1.03	
Mean number of years of quitting±SD (years)	1.37±0.51	

mild obesity, 3.1% had severe obesity, 6.6% were underweight and 46.7% had normal weight. Fifteen percent of the students had unacceptable waist circumference (more than 80 cm), and 11.9% of them had unacceptable waist hip ratio (more than 0.85). No one was diagnosed to have hypertension type 2. Results of the blood analysis revealed that 2.5% of the students had unacceptable fasting blood glucose level (more than 125 mg/dl), 31.1% had unacceptable fasting blood cholesterol level (more than 200 mg/dl) and 33.6% had unacceptable fasting blood triglycerides level (more than 150 mg/dl).

DISCUSSION

Smoking

Studies have shown that in addition to the physical consequences of adolescent tobacco use, there are also longer-term behavioral, social, educational and mental health effects. In the present study, only 3.1% of the students reported to be current smokers of which, 42.9% were daily smokers (Table 2). The smoking prevalence in this study is consistent with the prevalence observed in more than 12 cited articles on smoking among university students in Saudi Arabia (Al-Turki and Al-Rowais, 2008; Al-Mahmoudi and Amin, 2010), where the overall tobacco consumption among female students ranged from 1 to 16%. Low prevalence has also been observed in other studies conducted on female college students of different universities in Saudi Arabia, where the prevalence was (8.6 and 4.3%, respectively) (Koura et al., 2011; Al-Kaabba et al., 2011). The observed lower prevalence of smoking among female students in our study can be attributed to the ''social stigma'' that may force students to avoid reporting being a smoker, as smoking is considered a taboo in conservative communities such as Saudi Arabia, especially Taif which may be responsible for the underreporting among females (Mandil et al., 2011).

Physical activity

Physical inactivity is considered an independent risk factor of a number of chronic diseases such as coronary heart disease, diabetes and hypertension (US Department of health and human services, 1996). Studies also proved that participation in regular physical activity over time is associated with a decrease in all causes of mortality (Lollgen et al., 2009). In Saudi Arabia, the published reports on physical activity profile of Saudi population indicated that the majority of them are physically inactive (Al-Nozha, 2007b).

In the present study the majority of our students (61.7%) were physically inactive (Table 3). This result is in agreement with a previous study revealing high prevalence of physical inactivity among all Saudi females generally, and among university students particularly (Lollgen et al., 2009). This is in consistence with results from the WHO STEPwise approach to NCDs surveillance

Table 3. Distribution of the female health colleges's students according to their physical activity and nutritional habits.

Characters	Health colleges students (n=227)	
	No.	%
Practicing of adequate physical activity:		
Yes	87	38.3
No	140	61.7
Number of hours spent in TV watching per week:		
< 14 h/week	128	56.4
≥ 14 h/week	99	43.6
Number of hours spent in using computer per week:		
<14 h/week	115	50.7
≥ 14 h/week	112	49.3
Mean value of metabolic equivalents of task (MET) minutes per week ± SD	130.95±34.83	
Fruits consumption per week:		
1-5 times	159	70.0
6-10 times	46	20.3
>11 times	9	4.0
Don't eat at all	13	5.7
Mean number of days to eat fruits in a typical week ± SD	3.16±0.8	
Mean number of servings of fruit to eat on one of those days ±SD	1.25±0.43	
Adequate intake of fruits		
Yes	57	25.1
No	170	74.9
Vegetables consumption per week:		
1-5 times	136	59.9
6-10 times	81	35.7
>11 times	3	1.3
Don't eat at all	7	3.1
Mean number of days to eat vegetables in a typical week± SD	4.48±1.14	
Mean number of servings of vegetables to eat on one of those days±SD	1.34±0.48	
Adequate intake of vegetables:		
Yes	92	40.5
No	135	59.5
Types of fats used for family cooking:		
Unsaturated	22	9.7
Saturated	116	51.1
Combined	89	39.2
Fast food consumption per week:		
1-5 times	161	70.9
6-10 times	50	22.0
>11 times	16	7.0
Mean number of fast food meals per week to eat (breakfast, lunch and dinner) ± SD	5.33±1.19	

conducted in Saudi Arabia in 2005, where 76.2% of females aged 15 to 24 years were physically inactive (Saudi Arabia Ministry of Health, 2005). When compared with similar studies, the results of our study are in agreement with those revealed from other Iranian and Jordanian studies (Kelishadi et al., 2007; Suleiman et al.,

Table 4. Distribution of the participant students according to their physical measurements.

Characters	Health colleges students (n=227)	
	No.	%
Body mass index (BMI) (kg/m^2)		
Underweight (<18.5)	15	6.6
Normal weight (18.5-24.99)	106	46.7
Overweight (25-29.99)	65	28.6
Mid Obesity (30-34.99)	34	15
Severe obesity (≥35)	7	3.1
Mean value of body mass index ± SD	26.43±5.56	
Waist circumference		
Acceptable (< 80 cm)	193	85
Unacceptable (≥ 80 cm)	34	15
Mean value of waist circumference ± SD	70.93±10.57	
Waist/Hip ratio		
Acceptable (<0.85)	200	88.1
Unacceptable (≥0.85)	27	11.9
Mean value of Waist-to-Hip Ratio ± SD	0.74±0.07	
Fasting blood glucose		
Acceptable < 125 mg/dl	116	97.5
Unacceptable ≥ 125 mg/dl	3	2.5
Mean value of blood glucose ± SD	90.98±18.61	
Fasting blood cholesterol		
Acceptable < 200 mg/dl	82	68.9
Unacceptable ≥ 200 mg/dl	37	31.1
Mean value of blood cholesterol ± SD	191.05±45.98	
Fasting blood triglycerides		
Acceptable < 150 mg/dl	79	66.4
Unacceptable ≥ 150 mg/dl	40	33.6
Mean value of blood triglycerides ± SD	151.33±66.13	
Systolic Blood Pressure		
Normal systolic BP < 120 mm Hg	146	64.3
Prehypertension 120-139 mm Hg	54	23.8
Stage 1 hypertension 140-159 mm Hg	27	11.9
Stage 2 hypertension ≥ 160 mm Hg	0	0.0
Mean value of systolic blood pressure ± SD	120.38±14.01	
Diastolic Blood Pressure		
Normal diastolic BP < 80 mm Hg	194	85.9
Prehypertension 80-89 mm Hg	30	13.2
Stage 1 hypertension 90-99 mm Hg	2	0.9
Stage 2 hypertension ≥ 100 mm Hg	0	0.0
Mean value of diastolic blood pressure ± SD	77.64±6.46	

2009). The high level of physical inactivity observed in this study could be attributed to the limited opportunities of Saudi females to engage in physical activity due to the absence of physical education programs for girls, in addition to cultural reasons where families may not encourage females to engage in physical activity. Moreover, most of Saudis rely on cars rather than walking for short-distance travel (Al-Hazzaa, 2006; Al-Hazzaa et al., 2011).

The World Health Organization's "Global Recommendations on Physical Activity for Health" has proposed more than 150 min of moderate-intensity physical activity (PA) per week to maintain body weight. In the present study the mean value of metabolic equivalents of task (MET) minutes per week was (130.95) min, and this did not meet the (WHO's) "Global Recommendations on Physical Activity for Health (WHO, 2010b). The sedentary behavior was defined as spending three or more hours per day sitting, watching television or playing computer games (Guthold et al., 2010). In the present study, 43.6 and 49.3% of the students were watching TV and using the computer for more than 14 h per week. These results are lower than those revealed from a study done on a sample of Saudi adolescents in Al-Khobar, Jeddah and Riyadh cities, where 84% of males and 91.2% of females spent more than 2 h on screen time daily (Al-Hazzaa et al., 2011). This can be attributed to the engagement of our students in medical education. A non-significant correlation was found between minutes of physical exercise (MET values) with other variables (fast food consumption, TV watching, computer usage, blood pressure, waist circumference and waist-hip ratio measurements) (Table 6). Similar results were revealed from another Saudi study on university students (Sabra et al., 2007).

Diet

College students are highly exposed to unhealthy eating habits leading to body weight gain (Huang et al., 2003). In this study, based on the Center of Disease Control and Prevention (CDC) recommendations of current daily fruit and vegetable intake (CDC, 2013), only 25.1 and 40.5% of the students consumed adequate amounts of fruits and vegetables per week, respectively (Table 3). The same results were observed from a study done in Al-Khobar, Jeddah and Riyadh cities (Al-Hazzaa et al., 2011), and from a study done on male university students in Dammam and Qassim Cities (Sabra et al., 2007; Al-Rethaiaa et al., 2010). Low intake of vegetables and fruits observed among the studied students could be attributed to the low content of vegetables in most of the traditional Saudi meals (for example, Kabsa, Margog, Mandy) (Al-Rethaiaa et al., 2010). Other causes are the increasing consumption of animal products and refined foods in Saudi diet at the expense of vegetables and fruits, and the uncommon intake of raw vegetables and fruits in the course of meals among Saudi population (Al-Rethaiaa et al., 2010; Amin et al., 2008). Similar results of low fruit and vegetable consumption were reported from studies done on adolescents and university students in Iran, Syria and United Arab Emerates (UAE) (Kelishadi et al., 2007; Mahmood et al., 2012; Kerkadi, 2003).

About seventy percent (70.9%) of the students reported consumption of fast food in breakfast, lunch or dinner 1 to 5 times per week. This high consumption was also revealed from a study on female university students in Dammam city (Koura et al., 2012), and from studies done on adolescents and university students in UAE and Syria (Kerkadi, 2003; Bashour, 2004). About fifty percent of our students (51.1%) reported using saturated fatty acids in family cooking. This was also revealed from a previous Saudi study (Koura et al., 2012), and from other studies in the Middle East (Musaiger, 2002). This observed bad dietary habits could be attributed to the rapid improvement in the economy which makes people to consume diets high in saturated fat, cholesterol, salt, and refined carbohydrates, and low in polyunsaturated fats and fiber (Galal, 2003).

Body mass index

In Saudi Arabia, the dietary changes were accused for increasing the prevalence of both overweight and obesity (El-Hazmi and Warsy 2002). In an earlier study done in Taif city in 1996, the prevalence of underweight and overweight or obese was 14.7 and 16.3%, respectively (Madani et al., 1996). In the present work, 28.6% of the students were overweight, 18.1% had mild to severe obesity and 6.6% were underweight and 46.7% had normal weight (Table 4). Nearby results were observed from a study done on university students in Riyadh, where 31% of the sample were overweight, 23.3% was obese and 45.8% had normal body weight (Al Turki, 2007). These findings were also close to data from studies done on Saudi female university students, Saudi females in the childbearing age (AL Qauhiz, 2010; Al-Malki et al., 2003), and Saudi female adolescents (Al-Hazzaa et al., 2012). These high figures of overweight and obesity in our study can be explained in view of the predominance of unhealthy dietary behaviors of participants. Our figures are higher than that observed in other Arab and Eastern countries. This may be attributed to better education and modern dress of female university students in these countries which outlines their body contours as compared to the traditional dressings in KSA (Suleiman et al., 2009).

In the present work, 15% of the students had unacceptable waist circumference (WC) (more than 80 cm), and according to the waist hip ratio indicating central obesity, 11.9% of them had unacceptable waist hip ratio (WHR) (more than 0.85) (Table 4). This high prevalence of

Table 5. Correlation between BMI categories and other variables.

Variables	BMI categories	
	*r	p-value
MET minutes of physical exercises	-0.17	0.01
Diastolic blood pressure	-0.004	0.95
Systolic blood pressure	0.08	0.214
Triglyceride	0.194	0.034
Cholesterol	0.268	0.003
waist circumference	0.18	0.005
Waist hip ratio	0.22	0.001

*Spearman's correlation.

Table 6. Correlation between MET minutes of physical activity and other variables.

Variables	Actual minuets of physical exercise (MET values)	
	r*	p-value
Fast food consumption	0.06	0.30
Watching TV	0.03	0.61
Using computer	-0.04	0.49
Diastolic blood pressure	-0.06	0.30
Systolic blood pressure	0.06	0.33
BMI	-0.17	0.01
Waist/hip ratio	-0.08	0.19
Waist circumference	-0.06	0.33

*Spearman's correlation.

unacceptable WC and WHR was also observed in another two studies conducted on Saudi female university students and healthy young Saudi females (Al Kadi and Alissa, 2011; Koura et al., 2012). In addition, the mean value of waist circumference observed in this study is comparable to data observed in a previous study on Saudi adolescents (Al-Hazzaa et al., 2012). A significant negative correlation was found between actual MET minutes of physical exercises and the BMI categories (Table 6). This finding is consistent with studies which proved that physical inactivity is a leading factor of obesity during adolescence (Kelishadi et al., 2007). The same findings were revealed from studies done in USA and other 34 countries (Janssen et al., 2005), and from other Saudi studies (Mahfouz et al., 2008; Al-Hazzaa et al., 2012).

Lipid profile (Cholesterol and TG)

According to the WHO's STEPwise approach to Surveillance (STEPS) of Non-Communicable Diseases (NCD) conducted in Saudi Arabia in 2005 (Saudi Arabia Ministry of Health, 2005), the overall prevalence of dyslipidemia ranged from 20 to 40%. In this study, 31.1% of the students had unacceptable fasting blood cholesterol level and 33.6% had unacceptable fasting blood triglycerides (TG) level (Table 4). Similar results of presence of dyslipidemia among young Saudi population were revealed from a large population-based study conducted in Riyadh city, where the prevalence of low HDL-C was 85% among the age group between 18 to 29 years (Al-Daghri et al., 2010). Results revealed from this study are in agreement with a recent study done on healthy young Saudi females which showed remarkable hyperlipidemia (Al Kadi and Alissa, 2011). However, our results are lower than that witnessed in other Arabian and Western countries (Shawar et al., 2012; Palomo et al., 2006). This difference could be attributed to the variations in lifestyles and demographic features and to the high carbohydrate intake which was reported in the Saudi youth (Amin et al., 2008). A significant positive correlation was found between BMI categories and the levels of blood lipids (cholesterol and triglycerides) (Table 5). This result was also revealed from studies done on Saudi male university students (Al-Ajlan, 2011; Hegazi et al., 2011), and it is consistent with studies done in other countries (Humayun et al., 2009).

Hypertention

In KSA, previous studies on the prevalence of hypertension attributed the high prevalence to lifestyle

changes towards urbanization and dietary eating habits (Al-Nozha et al., 2007). In the present study, 23.8% of the students had systolic pre-hypertension, 13.2% had diastolic pre-hypertension (Table 4). The mean value of systolic and diastolic blood pressure observed in our study is comparable to those observed in a study on female university students of King Saud University in 2011 (Abdel-Megeid et al., 2011). According to the prevalence of pre-hypertension, our results are in consistence with those observed from another study on female university students in Dammam city, where 13.5% of them were pre-hypertensive (Koura et al., 2012). However a higher prevalence was observed in another study on male students in the same region (Sabra, 2007). In the present study, 11.9% of the students were diagnosed to have systolic hypertension, and only 0.9% of the students were diagnosed to have diastolic hypertension type 1. This result is much lower than that observed in a national survey in Saudi Arabia, where 7.8% of population aged 15 to 24 years were hypertensive (Saeed et al., 2011).

Diabetes

Previous studies from Saudi Arabia suggested that the rapid socioeconomic changes in the country over the last thirty years have contributed to the high prevalence rate of diabetes (Madani et al., 2000). In the present work, 2.5% of the students had high fasting blood glucose level (Table 4). This result is in consistence with results revealed from the WHO STEP wise survey conducted in KSA in 2005, where 2.4% of women aged 15 to 24 years were diagnosed to have diabetes (Saudi Arabia Ministry of Health, 2005). In comparison to other Arabian countries, higher figure was observed from a Lebanese study, where 3.5% of adolescents were diagnosed to have diabetes (Salameh and Barbour, 2011).

Study limitations

This study has some limitations including the small sample size, and the inclusion of young educated females which may limit the generalizability of our results. In addition, risk factors were assessed using a questionnaire, a form of assessment that could be subjected to recall bias. In a conservative community as Saudi Arabia, women may feel ashamed to admit certain habits as smoking. That is why longitudinal studies on large samples of young population including both sexes should be carried out.

CONCLUSION AND RECOMMENDATIONS

The aim of this study was to assess the prevalence of risk factors of NCDs among female university students. Results of the study revealed a high prevalence of these risk factors among the participants. The study calls for the importance of implementation of educational and awareness programs on NCDs risk factors to Saudi young population. These programs should focus on the importance of adoption of healthy life styles in this young age, to avoid the occurrence of NCDs in adulthood. Further studies should be done to assess knowledge and attitudes of young Saudis to healthy lifestyles, and to address barriers towards adopting it.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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ABBREVIATIONS

NCDs, Non-communicable diseases; **WHO,** World Health Organization; **KSA,** Kingdom of Saudi Arabia; **IPAQ,** international physical activity questionnaire; **MET,** metabolic equivalents of task minutes per week; **BMI,** body mass index; **JNC,** Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure; **WC,** waist circumference; **W/H R,** waist/hip ratio; **TG,** triglycerides; **r,** Spearman's correlation; **N-NCDs,** nutrition-related non-communicable diseases; **CDC,** Center of Disease Control and Prevention; **UAE,** United Arab Emerates; **USA,** United States of America; **HC,** hypercholesterolemia; **EMR,** Eastern Mediterranean Region; **HDL-C,** high density lipoproteins-C; **TC,** total cholesterol.

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Prevalence of risk factors of chronic diseases in Senegalese retired men

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The prevalence of chronic-degenerative diseases (CDD) is increasing rapidly in many countries throughout the world. This increase is mainly related to changes in lifestyles, but very little is known on adults from the developing countries. The aim of the study was to provide data on the prevalence of risk factors of chronic diseases in retired Senegalese men, and to investigate the relation between these risk factors and their socio economic status. A cross-sectional study was undertaken on 203 retired men aged 70 ± 7 years, living in Dakar and suburbans (Senegal). Clinical examination, anthropometry (weight, height, hip and waist circumferences), fasting glucose, triglycerides, total, high density lipoprotein (HDL) and low density lipoprotein (LDL) cholesterol were carried out. Socio-economic data were also collected. The prevalence of CD risk factors was very high. 76.6% of the retired men were at risk of cardiovascular diseases, 31% were overweight and 28% have high fasted blood glucose. Hypertension was present in 33% of the population. Abdominal fatness (wait to hip ratio) was significantly more important in the high income group than in the lower income group. The high prevalence of CDD risk factors in the older Senegalese men is associated with their advanced age and their socio-economic conditions.

Key words: Risk factors, prevalence, chronic diseases, Senegalese retired men.

INTRODUCTION

The number of individuals aged 60 years or older is projected to double as a proportion of the world's population and to more than triple in number over the next 50 years. These changes will be most dramatic in the less developed countries, where the transition from a young to old age structure will be more compressed in time than it has been for developed countries (Tucker and Buranapin, 2001). At the same time, the prevalence of chronic-degenerative diseases (CDD), such as cardiovascular disease (CVD), type 2 diabetes, arterial hypertension and obesity, is increasing rapidly in adults in many countries throughout the world. This increase is

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particularly alarming in transitional or developing countries where health care systems are generally and inadequate unable to respond to the chronic care needed by persons suffering from CDD. The number of people with diabetes in developing countries is projected to almost triple by the year 2025.

Hypertension and vascular disease are also rapidly becoming more prevalent (Tucker and Buranapin, 2001). Factors that have been implicated include a characteristic sequence of change in diet and decline in physical activity associated with social and economic change. The social changes that accompany urbanization will likely increase nutritional risk for elderly individuals. Diets are becoming higher in fats, animal products, and refined foods and lower in fiber, contributing to rapidly increasing prevalence of obesity and type 2 diabetes (Zohoori, 2001; Mokhtar et al., 2001; Monteiro et al., 1995).

Many chronic diseases occur in the age group of 50 years and older but this age group deserves little attention. The elderly are not currently viewed as a priority group for nutrition services. Nutrition interventions in African countries, when available, are directed primarily toward infants, young children, and pregnant and lactating women (Charlton and Donald, 2001). Poverty, unhealthy diet and decreased activity generally compromise nutritional status in term of both under- and over-nutrition (Zohoori, 2001). The lack of systematic studies on nutritional status and determinants of poor nutritional status among this population group limits the development of appropriate strategies to improve their health care. Few studies have directly assessed the nutritional status and risk factors of chronic disease of older persons living in the developing countries.

To reduce the impending burden of disease and disability worldwide, urgent action is needed to understand and to address the nutritional needs of the aging population living in developing countries. Thus, a study was conducted to estimate the prevalence of risk factors for chronic diseases in a population of Senegalese elderly retired men utilizing the Medical and Social Center of the Institution de Prevoyance Retraite du Senegal IPRES (Senegalese National Institute for Pensions Funds) , Dakar-Senegal.

METHODOLOGY

The site of study

The Geriatric and Gerontological Center (GGC) of IPRES, Dakar-Senegal was used for this study. It is a health center for the retired Senegalese elderly populations affiliated to Institution de Prévoyance Retraite du Sénégal (IPRES), ensuring medical and social services. As a primary health care center with diverse health personnel, it ensures full and free medical care to the retired elderly population and their families. A pharmacist offered free medications (http://www.ipres.sn).

The type of study

The study was a cross-sectional one carried out during three months in a population of 203 non-disabled men pensionaries randomly selected at the GGC of IPRES (database).

The study population

The study population was composed of Senegalese elderly patients aged 60 years and over who came to the Geriatric and Gerontological Center of IPRES for health problems. This population is affiliated to IPRES. The total number of pensioned at IPRES was 102,153 in 2003. The mean pension salary varies from 15.4 to 496 US$ and 80% received less than 142 US$ every 3 months (http://www.ipres). We excluded patients with chronic diseases, coma, hospitalized for disease, of whom data collection was not possible.

Data collection

Every subject underwent a clinical exam by a Doctor of the Center completed with an administration of a questionnaire to collect data on sociodemographic characteristics, medical history, medication, lifestyles, anthropometric measures. Body weight, height or arm span and half span were measured using standard procedures. Hip and waist circumferences were also been measured to determine fat distribution. Measure of height was made using a height board to the nearest millimeter. Body weight was measured with an electronic scale, with a maximal range of 200 kg and a precision of 100 g (OHAUS, Giessen, Deutschland). Body mass index (BMI) was computed using the classic formula Weight/height^2 (Keys et al., 1972). Blood pressure was recorded, diabetes too with blood test. Every patient also had biological exams. Fasting venous blood was drawn and put into a 5 ml tube coated with ethylenediamine-tetraacetic acid (EDTA) (Becton Dikinson, Plymouth, UK) for the determination of fasting plasma triacylglycerols, total and HDL-cholesterol. Plasma triglycerides, plasma cholesterol (total and HDL) was analysed by spectrophotometry (ASA Junior II, Coultronics, Margency, France) methods using kits (Randox Laboratories LTD, Crumlin, UK). LDL cholesterol was calculated using Friedewald equation (LDL-cholesterol = Total cholesterol – [HDL-cholesterol – (triglycerides/5)]. Fasting blood glucose was directly measured by photometry at 500 ± 20 nm and reagent were purchase from Helena Glucose HemoCue (Glucose HemoCue, Helena, Angelholm, Swedish). Consent was obtained from each subject.

Sociodemographic data

Data on education level (no, primary, secondary, university degree), socio-economic status such as housing characteristics (household density (number of rooms and persons), ethnicity, type of occupation, pension fund, type of wife's and children's occupation, and number of years of formal employment were recorded. For the socioeconomic score, we computed the following variables: occupation (cadre: 2 points, blue color: 1 point), revenue per trimester (< 50 000 FCFA: 1 point, ≥ 50 000 FCFA: 2 points), comodities/housing characteristics: water source, electricity, television, refrigerator, telephone: (minimum categorized as absence of electricity or water source: 1 point, maximum categorized as presence of all comodities: 2 points) and other financial

Table 1. Prevalence (%) of risk factors in the whole population.

Variables	Prevalence (%)
BMI ≥ 25 kg/m^2	31.2
Hip to waist ratio ≥ 0.95	5.9
Systolic pressure ≥ 160 mm Hg	33.2
Diastolic pressure ≥ 95 mm Hg	17.7
Fasting glucose ≥ 95 mg/dl	28.3
Total cholesterol ≥200 mg/dl	41.5
HDL cholesterol ≤ 35 mg/dl	69.8
LDL cholesterol ≥ 150 mg/dl	38.0
Triacylglycerol ≥ 150 mg/dl	14.1
TC/HDLC ratio ≥ 4.5	76.6

resources (< 50 000 FCFA: 1 point, ≥ 50 000 FCFA: 2 points). Thus, subjects whose socioeconomic score was between 1 to 5 points were classified as moderate to low socioeconomic status and those with score between 6 to 8 points were considered as having a high socioeconomic status. Obesity was defined as a score of BMI ≥ 30 kg/m^2 and overweight as a score of BMI between 25 and 29.99 kg/m^2. Abdominal obesity was defined as a Waist-to-hip ratio ≥ 0.95 (Iwao et al., 2001).

Statistical analysis

Univariate and bivariate analysis were computed. The population of study was divided into two sub-groups according to their socioeconomic background. Differences in body composition and metabolic characteristics between the 2 socioeconomic groups were determined using Student's t-test. Prevalence of risk factors of chronic diseases was estimated and comparisons done using the Chi square test. Means were calculated with standard deviation. Statistical analysis was performed using statistical package for social sciences (SPSS) 11.5 (SPSS Inc, Chicago, IL, USA). P-values less than 0.05 were considered as significant.

Ethical consideration

Before the start of the study, informed consent was obtained from the patient and/or his/her relative.

RESULTS

The study population had a mean age of 70 years ± 7 with a significant age difference: 68.7 years ± 6 for the high socioeconomic group and 71 years ± 7 for the low and moderate socioeconomic group (P < 0.01). The majority of the retired men belonged to the low to moderate socioeconomic status (77.2%) group and 74.5% were working as blue color. They were married (96%), with only 4.6% having a wife who was still having a salary. Table 1 presents the prevalence of risk factors for chronic diseases according to socioeconomic status.

We observe that there is a high prevalence of risk factors for cardiovascular diseases in the total population of study: overweight (31.2%), Waist-to-hip ratio ≥ 0.95 (5.9%), systolic blood pressure ≥ 160 mm HG (33.3%), diastolic blood pressure ≥ 95 mm HG (17.7%), total cholesterol ≥ 200 mg/dl (42.6%), HDL cholesterol ≤ 35/dl (69.8%), LDL cholesterol ≥ 150 mg/dl (40.1%), triacylglycerols ≥ 150 mg/dl (14.1%) and total cholesterol/HDL Cholesterol ≥ 4.5 (76.6%). The prevalence of metabolic syndrome was estimated at 77.2%.

The mean weight, height, BMI, hip and waist did not vary significantly with socioeconomic status. However, subjects of the high socioeconomic status had a higher Waist-to-hip ratio (P < 0.016) compared to subjects with low to moderate socioeconomic status. However, BMI, waist circumference, systolic blood pressure, diastolic blood pressure (Table 2) varied. The difference was only significant for total cholesterol and triacylglycerol between the two socioeconomic groups. In fact, total cholesterol and triacylglycerol were higher for the high socio-economic group with respectively (208.9 ± 56 vs 187.9 ± 44.1, P < 0.008; 122.9 ± 48.9 vs 105.7 ± 45.9, P < 0.028). However, glucose, HDL and LDL cholesterol did not vary significantly between the two groups (Table 3).

DISCUSSION

The analysis of the results of our study shows that abdominal obesity is more prevalent in subjects of the group high socio-economic status group. They had also a higher cardiac pulse, total cholesterol and triglycerides were more important. The high prevalence of abdominal obesity in this group could be related to an increase of food availability and dietary diversification. Western culinary influences lead to new consumption patterns, which affect dietary habits and thus the rhythm of consumption (Mokhtar et al., 2001). These new dietary habits have created conditions for chronic diseases like abdominal obesity and diabetes.

The prevalence of vascular risk factors of CVD is very important in the retired Senegalese men of IPRES (77.2%). This prevalence is higher than the one observed by Guèye in Senegal in 1998 (40%) in retired men and women (Gueye, 1998). This high prevalence could be a consequence of the low concentration of serum HDL cholesterol in the population of study. In fact, high cholesterol HDL concentration has a protective effect against the CVD and increases life expectancy of subjects (Chyou and Eaker, 2000). In the same way, Schaefer reported that a low concentration of HDL cholesterol increases the risk of chronic diseases (Schaefer, 2002). The low concentration of HDL cholesterol in the subjects could be related to their ageing process. Indeed, liver function occurs as part of biological

Table 2. Anthropometric characteristics according to socioeconomic status.

Parameter	High socioeconomic status (n=46)	Low to middle socioeconomic status (n=158)	P value
Weight (kg)	70.6±12.4	69.1±12.4	0.48
Height (m)	1.8±0.1	1.7±0.1	0.25
BMI (kg/m^2)	23.8±4.4	23.4±4.0	0.59
Hip circumference (cm)	86.0±7.3	85.0±8.0	0.41
Waist circumference (cm)	94.1±7.0	94.4±7.5	0.8
WHR	0.91±0.03	0.89±0.03	0.01

BMI= Body mass index; WHR = Waist to hip ratio.

Table 3. Biological characteristics according to socioeconomic status.

Parameter	High socioeconomic status (n=46)	Low to middle socioeconomic status (n=158)	P value
Fasting Glycemia (mg/dl)	106.0±48.7	98.3±46.9	0.33
Total Cholesterol (mg/dl)	208.9±56	187.9±44.1	0.008
HDL Cholesterol (mg/dl)	32.1±24	31.3±15.9	0.23
LDL Cholesterol (mg/dl)	153.1±55.3	137.3±45.7	0.052
Triacylglycerol (mg/dl)	122.9±48.9	105.7±45.9	0.028
TC/HDL-C ratio	8.9±5.9	7.8±4.9	0.18

ageing, and this biological ageing process might emerge as a much more important alteration/reduction of HDL level for older individuals (Chyou and Eaker, 2000). CVD is also related to obesity. The prevalence of obesity is increasing very quickly in developing countries. According to WHO analysis (WHO, 2002), 21% of the cardiovascular diseases are linked to BMI > 21 kg/m^2.

In Morocco and in Tunisia where the prevalence of obesity is very high, mortality by cardiovascular diseases is 25 to 30% (Mokhtar et al., 2001). Obesity increases the level of triglycerides and LDL cholesterol and decreases HDL cholesterol (Kamath et al., 1999; Solomon and Manson, 1997). Cholesterol LDL is strongly implicated in the causality of the CVD. According to Schaefer, the reduction of LDL cholesterol of 1% involves a diminution of the risk of CVD of 1% (Schaefer et al., 2002). We noted also that percentage of body fat increases the risk of CVD ($b = 0.45$, $p < 0.02$).

Prevalence of diabetes in African communities increases with the ageing of the population. This prevalence in black Africans living in urban area was estimated at 6% by Sobngwi et al (2001). In our study, the prevalence of the hyperglycemia was 28%. This prevalence could be linked to several factors such as abdominal obesity, family history of diabetes, increase of cardiac pulse. The abdominal obesity defined by the waist-to-hip ratio strongly increased the risk of hyperglycemia in retired Senegalese men of IPRES ($b = 197$, $p = 0.017$). Visceral fat content, rather than total body obesity is particularly a strong risk factor of chronic diseases (Zamboni et al., 1994). Abdominal obesity induced impaired glucose tolerance, insulin resistance and reduction of insulin secretion in elderly individuals (Solomon et al., 1997; Krishnan et al., 2003; Goodpaster et al., 2003).

According to Abolfotouh et al. (2001) and McNeely et al. (2001), as abdominal obesity increases more the risk of diabetes increases also. In our study, if abdominal obesity increases by one unit, the risk of hyperglycemia increases by 197 times. The risk of hyperglycemia is also correlated to the fact of having a trader/commercial woman. It is a social fact in Senegal that the more the women earn money, the more she spends for family diet, especially for husband diet which generally increases in fats and sugar foods. The majority of our subjects presenting with hyperglycemia have also family history of diabetes. McNeely et al. (2001) found that familial history of diabetes predisposes subjects at a later risk of diabetes at adulthood. A high cardiac pulse which defines heart beats was found as a risk factor of hyperglycemia ($b = 1.22$, $p < 0.01$). This result could be explained by the fact that adrenalin and noradrenalin increase the heart rate and consequently increases the risk of hyperglycemia (Clement et al., 2004).

Hypertension is the most common cardiovascular disease and a major public health problem in both

developed and developing countries. The prevalence of systolic arterial hypertension is high in our study population (33%). However there was no difference between socioeconomic group; we have observed that prevalence was higher in low and moderate socioeconomic group (33.5% versus 32.6%). This prevalence is higher than the estimated one according to WHO in the Senegalese general population: 7% in urban areas and 4.9% in rural areas (Antezana, 2003). The main risk factors of hypertension in elderly Senegalese retired men were high fat-free mass and high percentage body fat.

Conclusion

This study showed that, in a developing country like Senegal, the prevalence of cardiovascular diseases risk factors is very high among retired elderly men. These factors are hypertension, low HDL cholesterol, abdominal obesity and hyperglycemia. Their role on the occurrence of cerebrovascular and cardiovascular diseases is known. It is important to identify them during our daily practices for their better management. It is necessary to take into consideration these results to elaborate and implement preventive strategies during the ageing process (before retirement especially) at the working place.

Conflict of Interests

The author(s) have not declared any conflict of interests.

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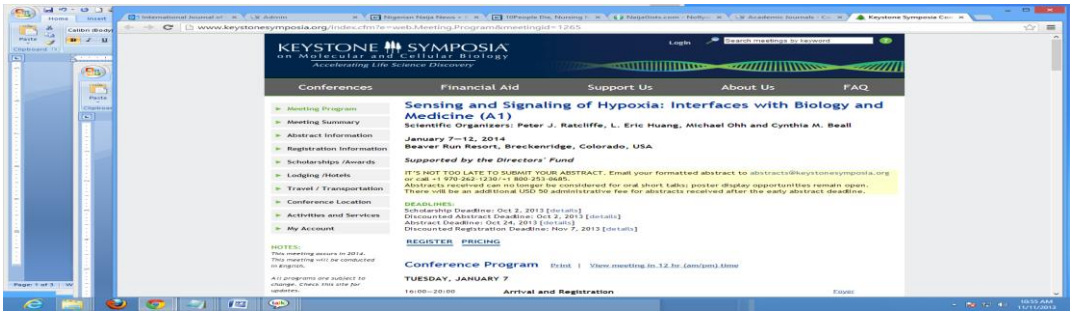

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International Conference on Biomedical Engineering and Systems, Prague, Czech Republic

September 2014
Life Sciences Baltics 2014 (LSB 2014), Vilnius, Lithuania

International Journal of Medicine and Medical Sciences

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- *African Journal of Pharmacy and Pharmacology*
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