

Urothelial neoplasia as occupational hazard among furniture workers in Calabar, Nigeria

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Abstract: Urothelial neoplasia as occupational hazard among furniture workers in Calabar, Cross River State, Nigeria was investigated using urine cytology (Papanicolaou and May Grunwald-Giemsa staining techniques). Combi-9 strips were used for preliminary screening for haematuria. A total of 40 urine samples from male furniture workers (mean age 40 years) were examined. Urine samples were also collected from 10 non furniture workers and these served as control. These samples were randomly voided urine samples. Haematuria was observed in 6(15%) of the subjects. The cytology results were classified into four groups; normal urothelial cells, mild cellular atypia (probably benign), moderate cellular atypia (indeterminate for malignancy), severe cellular atypia ("suspicious" of malignancy). There was a non-significant prevalence of 47.5% urothelial neoplasia i.e mild to severe cellular atypia among the examined samples. No malignancy was established, although two specimens had severe cellular atypia ($p < 0.05$) which was suspicious of malignancy rather than reactive changes. The study did not reveal strong relationship between cigarette smoking and development of urothelial neoplasia, only one (33.3%) of the three smokers in the study developed moderate cellular atypia. Similarly, no strong relationship was observed with alcohol consumption. Of 26(65%) non-alcohol consumer subjects, two(7.69%) developed severe cellular atypia, three(11.5%) had moderate cellular atypia while mild cellular atypia was observed in seven(26.9%) subjects. On the other hand, 14(35%) were alcohol consumers, three (21.4%) had moderate cellular atypia whereas mild cellular atypia was observed in four(28.6%) subjects. Long term exposure to chemicals was found to be a risk factor that predisposed the workers to development of urothelial neoplasia. Ideal work place safety practices should be upheld by furniture workers to prevent the development of urothelial neoplasia associated with occupational hazard.

Key words: Urothelial neoplasia, occupational hazard, furniture workers

I. Introduction

Bladder cancer (one of the urothelial neoplasias) is the most common malignancy involving the urinary system and the ninth most common malignancy worldwide [1, 2]. Urothelial neoplasia is caused by changes to the cells of the bladder. It is often linked with exposure to certain chemicals [3, 4]. Studies on urothelial cancer have identified multiple risk factors, the most important of which are cigarette smoking and various occupational exposures.

Urothelial carcinoma of the urinary bladder is one of the most frequent malignancies in industrialized countries [5]. Although the incidence of urothelial carcinoma in Japan is lower than in other industrialized countries, it is the twelfth and thirteenth most frequently diagnosed malignancies in men and women, respectively, and more than 6,000 people die of the disease per year [6]. Based on the 2004 World Health Organization classification of tumours of the urinary system, urothelial carcinoma has two subtypes based on cellular and structural atypia; low- and high-grade types, and two subtypes based on invasion; non-infiltrating and infiltrating types [7]. Low-grade urothelial carcinoma, which has an incidence of 70 – 80%, is usually noninfiltrating and has an excellent prognosis but shows frequent relapse [7]. About 30% of these recurrent tumours may show progression to higher grade with stromal invasion [7]. High-grade non-infiltrating urothelial carcinoma, including papillary and flat types, namely carcinoma in situ (CIS), often progresses to infiltrating carcinoma. High-grade infiltrating carcinoma usually has a poor prognosis [3]. About 90% of malignant tumors of the lower urinary tract occur in the urinary bladder, 8% in the renal pelvis and remaining 2% are seen in the urethra or ureters [1].

Workers in chemical, petrochemical, aniline dye, and plastic industries, as well as those exposed to coal, coke, tar and asphalt are at increased risk of renal, pelvic and urethral tumours [8]. Varnishes used by furniture workers in woodwork finishing have high content of aniline. Human cancer data are insufficient to conclude that aniline is a cause of bladder tumours while animal studies indicate that aniline causes tumours of the spleen [9].

Urine cytology is the most widely used noninvasive method to detect urothelial tumours. However, it is limited by its low sensitivity [10]. A limited literature exists on the incidence of urothelial neoplasia, and non at all from Calabar, among furniture workers, hence the need for this investigation. This study was carried out to establish whether or not hazardous chemicals used by furniture workers and other occupational risk factors predisposed them to urothelial neoplasia using urine cytology as diagnostic tool.

II. Materials And Methods

Collection of specimen

A total of 40 urine specimens were obtained from 40 subjects (male furniture workers; mean age 40 years) in Calabar, the capital city of Cross River State, located on the coastal region of southeastern Nigeria. The population was stratified and simple random sampling technique was used to select the subjects based on duration of exposure and work place safety practices. Questionnaires were used to obtain the demographics and workplace safety practices of the subjects

Processing of specimen

Urine specimens were analyzed for haematuria using Combi-9 strips before proceeding with cytological analysis using a combination of Papanicolaou and May Grunwald Giemsa staining techniques [11].

III. Results

Cytology results of the 40 specimens were classified into four groups: normal urothelial cells, 21; mild cellular atypia (probably benign), 11; moderate cellular atypia (indeterminate for malignancy), 6 and severe cellular atypia ("suspicious" of malignancy), 2. Haematuria was observed in 6(15%) of the subjects. Statistical analysis was performed using Pearson chi-square (χ^2) test. P-value of less than 0.05 ($P < 0.05$) was considered statistically significant.

Table 1 shows level of work place safety practice of the subjects and their cytology result; 18(45%) exhibited low level work place safety practice, 13(32.5%) exhibited moderate level work place safety practice while 9(22.5%) exhibited high level work place safety practice. One each of the furniture workers with low and moderate level work place safety practices developed severe cellular atypia whereas none of the furniture workers with high level work place safety practice developed severe cellular atypia. There was a significant relationship ($P < 0.05$) between work place safety practice and risk of development of urothelial neoplasia. Table 2 shows duration of exposure to chemicals and cytology result; 12(30%) had 2 – 5 years exposure, 10(25%) had 6 – 10 years exposure, 9(22.5%) had 11 – 15 years exposure, while those with 16 – 20 years and 21 – 25 years exposure were 4(10%) in each category, however only 1(2.5%) subject had an exposure time above 26 years. The 16 – 20 years and 26 years and above categories of exposure recorded one case each of severe cellular atypia. There was a significant relationship between duration of exposure and the risk of developing urothelial neoplasia among the furniture workers.

Table 3 shows cigarette smoking and cytology result; 3(7.5%) smoked cigarette out of which one developed moderate cellular atypia while two had normal urothelial cells. Table 4 shows alcohol consumption and cytology result; 14(35%) of subjects consumed alcohol while 2(7.69%) of the non-alcohol consumers developed severe cellular atypia. There was no significant relationship between alcohol consumption and development of urothelia neoplasia.

IV. Discussion

A high risk of bladder carcinoma has been observed in workers exposed to some aromatic amines. Based on these and other occupational risks, it was estimated that about 5 – 10% of bladder carcinomas in industrialized countries were due to exposures of occupational origin [12]. Substantial exposures among males to polycyclic aromatic hydrocarbon (PAH) as well as chlorinated solvents and their corresponding occupational settings have been associated with significantly elevated risks after adjustment for smoking [3]. In this study, it was observed that none of the furniture workers with high level work place safety practice developed severe cellular atypia, whereas 5.5% and 7.6% of workers with low and moderate levels of work place safety practices respectively, developed severe cellular atypia (Table 1).

Workers in industries that produce aniline dyes, rubber, plastic, textile and cable have high incidence of bladder cancer which may occur in workers in these factories after prolonged exposure of about 20 years [1]. This agrees with the findings of the present study where one case each of severe cellular atypia was recorded in furniture workers with 16 – 20 years and those with 26 years and above working experience, while no severe cellular atypia was recorded among workers with less than 16 years working experience (Table 2). The American Furniture Manufacturers Association recognizes that the Occupational Safety and Health Act 1970 requires that, in addition to compliance with hazard-specific standards, all employers have a general duty to provide their employees with a work place free from recognized hazards likely to cause death or serious injury.

This guideline was designed to help employers meet this responsibility. This guideline is advisory in nature and informational in content [13].

By far, the greatest known environmental risk factor in the general population is tobacco, especially cigarette smoking [14]. Smokers who are exposed to hazardous chemicals in the work place carry an even higher risk of developing bladder cancer [15]. The results of this study corroborates the above information. This is summarized on Table 3 which reveals that 33.3% of the furniture workers that smoked developed moderate cellular atypia. It is thought that some cancer-causing chemicals found in smoke enter the bloodstream after being absorbed by the lungs, are filtered through the kidneys, finally settling in the urine where they can then damage the cellular lining of the bladder [16]. There was a significant relationship ($P < 0.05$) between cigarette smoking and development of urothelial neoplasia.

Urothelial cancers, the target of urine cytology examination, are the most commonly detected malignancies in patients with microscopic haematuria [15]. Haematuria is the most common presenting sign in bladder cancer, occurring in about 90% of cases. Haematuria may be intermittent, so a urinalysis without red blood cells does not exclude a diagnosis of urothelial cancer. In patients with macroscopic haematuria, the reported rates of bladder cancer range from 13 – 34.5% [17, 18]. The present study revealed that only 15% of the total furniture workers (with or without cellular atypia) were positive for haematuria compared with 48% of the furniture workers that showed different levels of cellular atypia. Haematuria caused by cancer is usually visible (turning the urine pink or red), intermittent and does not cause pain. However, people with microscopic haematuria also rarely have bladder cancer [19]. In one study, only about 10% of people with visible haematuria and 5% of those with microscopic haematuria had bladder cancer [20]. Anyone who is over 35 years old who has visible blood in the urine should have a complete evaluation of the kidneys, ureters, bladder and urethra, especially men who are smokers [21].

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TABLE 1: Workplace safety and urine cytology of furniture workers in Calabar

WORKPLACE SAFETY	CYTOLOGY				Total
	Normal	Mild cellular atypia	Moderate cellular atypia	Severe cellular atypia	
Low level	10	4	3	1	18
Moderate	5	5	2	1	13
High level	6	2	1	0	9
Total	21	11	6	2	40

X^2 – tabulated = 12.592, df = 6

TABLE 2: Duration of exposure and urine cytology of furniture workers in Calabar

DURATION OF EXPOSURE (YEARS)	CYTOLOGY				Total
	Normal	Mild cellular atypia	Moderate cellular atypia	Severe cellular atypia	
2 – 5	6	3	3	0	12
6 – 10	4	5	1	0	10
11 – 15	7	1	1	0	9
16 – 20	2	1	0	1	4
21 – 25	2	1	1	0	4
26 and above	0	0	0	1	1
Total	21	11	6	2	40

TABLE 3: Cigarette smoking and urine cytology of furniture workers in Calabar

CYTOLOGY	CIGARETTE SMOKING		Total
	Yes	No	
Normal	2	19	21
Mild cellular atypia	0	11	11
Moderate cellular atypia	1	5	6
Severe cellular atypia	0	2	2
Total	3	37	40

X^2 – tabulated = 7.815, df = 3

TABLE 4: Alcohol consumption and urine cytology of furniture workers in Calabar

CYTOLOGY	ALCOHOL CONSUMPTION		Total
	Yes	No	
Normal	7	14	21
Mild cellular atypia	4	7	11
Moderate cellular atypia	3	3	6
Severe cellular atypia	0	2	2
Total	14	26	40

X^2 – tabulated = 7.815, df = 3

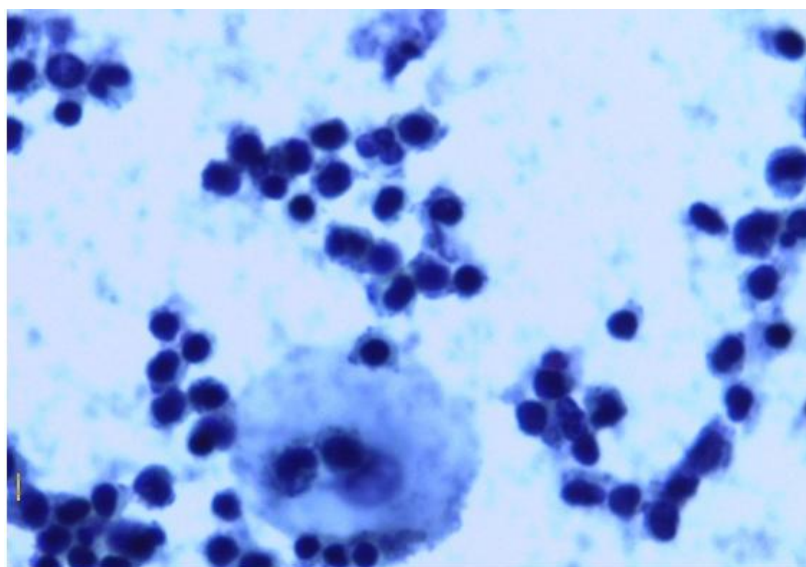


PLATE 1: urine cytology of furniture workers under five years exposure showing normal urothelial cells (Papanicolaou stain x200)

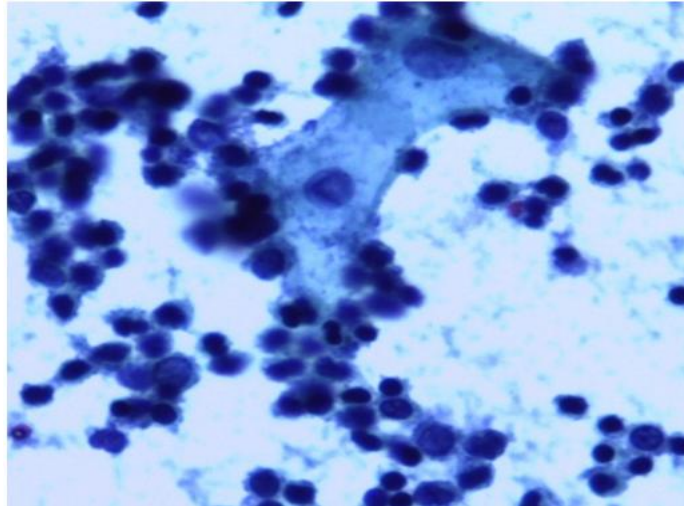


PLATE 2: Urine cytology of furniture workers above ten years exposure showing mild cellular atypia (Papanicolaou stain x200)

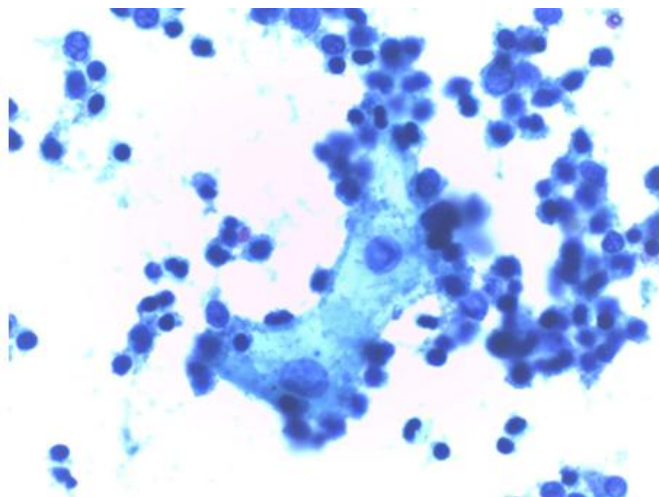


PLATE 3: Urine cytology of furniture workers above twenty years exposure showing moderate cellular atypia (Papanicolaou stain x200)

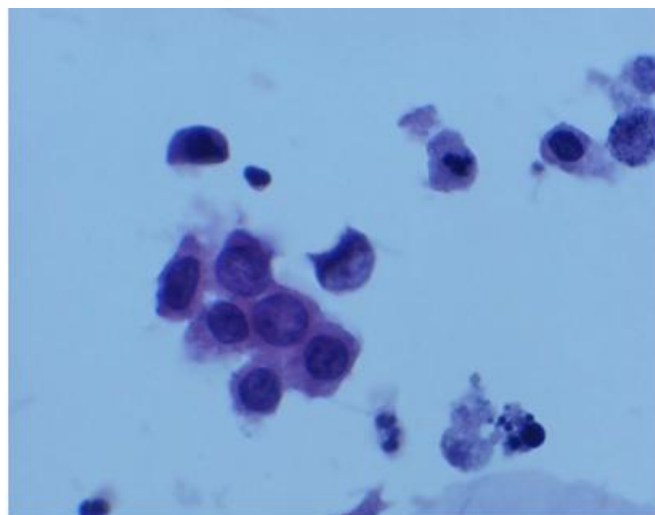


PLATE 4: Urine cytology of furniture workers above twenty years exposure showing severe cellular atypia (Papanicolaou stain x200)