
A retrospective analysis of occupational exposure to pesticides as a possible risk factor for non-melanoma skin cancers

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Dear Editor,

Occupational exposure to ultraviolet (UV) radiation is a known risk factor in the causation of non-melanoma skin cancer (NMSC). Squamous cell carcinoma and basal cell carcinoma are commonly described as NMSCs. The incidence of NMSC is high in western countries with an incidence of around 100 per 100 000 individuals in Europe and 99 per 100 000 individuals in Australia.^[1,2] The exact incidence of skin cancer in India is not known. Exposure to UV radiation is a known risk factor in the development of malignant melanoma of the skin and NMSC. The association of occupational exposure to UV radiation and NMSC has been demonstrated.^[3] Other factors responsible for NMSC include exposure to arsenic, tar (occupational exposure and therapeutic coal tar), ionizing

radiation, chronic inflammation like lupus erythematosus, lichen planus, genetic condition like xeroderma pigmentosum, and thermal burns. Recently photosensitizing agents have been shown to increase the risk of NMSC in population at risk.^[4] Patients with history of exposure to pesticides are at the increased risk of developing cancers. In rural India, the practice of using pesticides with bare hands and feet results in direct contact with pesticides, which might be a risk factor for the development of NMSC. Skin is the most exposed organ while handling pesticides by cultivators. In this series, a retrospective study of the epidemiology of NMSCs was done to identify possible high risk group of patients who develops NMSC.

The data of patients with NMSC have been obtained from the hospital cancer registry of a regional cancer center in eastern India for the period of January 2010 to December 2011. A total of 124 (*n*) histologically confirmed patients with NMSC were found in the database and have been included for this retrospective analysis. Parameters like gender, occupational history, and site distribution of NMSC were retrospectively analyzed. The occupational history was

recorded as per the information provided by the patients at the time of registration. The exposure to pesticides was presumed from the occupational history of the patients.

Sixty patients with NMSC were at the skin of upper and lower limbs, and 64 patients had NMSC of other skin sites like the head, neck, face, scalp, and trunk. Majority of the patients with NMSC were males accounting for 67.7% of patients. The relative proportion of NMSC was 1.1% in males and 0.8% in females [Table 1]. In this analysis, 48 (38.7%) patients were cultivators and 76 (61.3%) patients were with other professionals. The majority of NMSC were seen at the skin of the lower limbs. The distribution of sites were at the lower limb in 52 (43.3%), skin of scalp, neck, and face in 29 (23.3%), skin of the trunk in 18 (14.4%), skin of the eyelids in 11 (8.8%), skin of the upper limbs in eight (6.4%), skin of the external ear in five (4.03%), and skin of the lower lip in one (0.8%) of all patients with NMSC.

In NMSC of the skin of limbs, 32 (67%) patients were cultivators and 28 (37%) patients with NMSC of the limbs were not cultivators [Table 2]. The odds ratio (OR) showed the probability of developing NMSC of the limbs is more likely in patients with probable exposure to pesticides (95% CI-1.3651 to 6.164, $P = 0.0012 < 0.05$). It shows that there is a strong association of NMSC of limbs with possible exposure to pesticides (cultivators) in comparison with patients who were not possibly exposed to pesticides.

The NMSC mainly affects males and in our series males were twice affected. In dark-skinned population squamous cell carcinoma of the skin occurs in sites not exposed to the sun.^[5] In this analysis, the commonest site for the occurrence of NMSC was the lower limbs.

A confounding variable in this analysis was the exposure to the sunlight that was more likely in cultivators; however, the UV radiation-induced damage is not significant in the dark-skinned population due to the protective effect of eumelanin.^[6]

Dich *et al.*, has advocated the use of protective equipments and other measures by farmers from getting exposed to pesticides for reducing the risk of certain cancers.^[7]

The incidence of NMSC in this analysis is 1% of all other cancers. In our retrospective analysis, the prevalence of NMSC was more in the cultivators (39%), though further studies by case-control study or prospective cohort study for direct contact and detailed exposure assessment to individual pesticides will be required to establish the causal relationship of pesticides with NMSC in the cultivators.

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Table 1: The table shows the relative proportion of NMSC in males and females vis-à-vis the 10 leading sites of cancer in our registry

Site name	Relative proportion in males (%)	Site name	Relative proportion in females (%)
Esophagus	14.7	Cervix uteri	16
Hypopharynx	12	Breast	15.4
Mouth	7.9	Gallbladder	11.3
Lung	7.2	Esophagus	10.1
Tongue	6.7	Mouth	5.1
Stomach	6.4	Ovary	5.1
Larynx	5.8	Stomach	4.2
Tonsil	4.9	Tongue	2.8
Gallbladder	3.7	Lung	2.8
Oropharynx	3	Hypopharynx	2.6
NMSC	1.1	NMSC	0.8

RP=Relative proportion, NMSC=Non-melanoma skin cancer

Table 2: It shows the patients with possible exposure to pesticides had high prevalence of NMSC compared with NMSC of the limbs in the non-exposed group of patients

Possible history of exposure to pesticides	NMSC of upper and lower limb	NMSC of other skin sites	Total
Yes	32	16	48
No	28	48	76
Total	60	64	124

NMSC=Non-melanoma skin cancer

Manigreeva Krishnatreya, Amal C Katak, Jagannath D Sharma¹, Kaberi Lahkar

Departments of Hospital Cancer Registry, and ¹Pathology, Dr. Bhubaneswar Borooah Cancer Institute, Guwahati, Assam, India

Correspondence to: Dr. Manigreeva Krishnatreya, E-mail: mani_greeva@yahoo.co.in

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