

Cutaneous Malignancies in Farm Workers: Incidence, Risk Factors, and the Role of Dermatologists

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Abstract

Farm workers are consistently exposed to occupational hazards, notably prolonged ultraviolet (UV) radiation and potential contact with carcinogenic pesticides, which may elevate their risk for cutaneous malignancies.

Keywords: Skin Neoplasms, Melanoma, Non-melanoma skin cancer, Risk Factors, Occupational Exposure, Farm workers, Epidemiology, Solar ultraviolet radiation.

1. INTRODUCTION

Farm workers are essential to global food production, yet face significant occupational hazards that impact their long-term health, including prolonged ultraviolet (UV) radiation and exposure to pesticides, both linked to increased risks of cutaneous malignancies [1,2]. Unlike other occupational groups, farm workers work under direct sunlight for extended periods, resulting in cumulative UV damage and increased risk of skin neoplasms. Repeated contact with potentially carcinogenic pesticides further increases this risk [3]. However, preventive measures and protective policies for this population remain insufficient and under-prioritized in occupational health discourse. Systemic barriers (i.e. limited financial resources and inadequate employer-provided protective

equipment) lack consistent sun-protective measures [4]. Labor-intensive work in high temperatures also deters the use of long-sleeved clothing. Weak occupational health regulations, especially in low- and middle-income countries, compound these challenges [5]. Consequently, farm workers exhibit a disproportionately high prevalence of skin cancers compared to the general population, highlighting the need for targeted interventions and policy reforms.

Non-melanoma skin cancers (NMSCs), including basal cell carcinoma (BCC) and squamous cell carcinoma (SCC), remain among the most common malignancies in populations with high sun exposure [6]. Chronic exposure to UV radiation and pesticides places farm workers at particular risk. Financial constraints, geographic isolation, language barriers, and fear

of deportation discourage many seasonal or undocumented workers from seeking routine dermatologic care [5]. Dermatologists are essential in reducing occupational skin cancer incidence through education, outreach, and promoting regular screenings. Improving early detection and treatment requires systemic improvements, like stronger safety regulations, increased access to protective gear, and expansion of mobile dermatology clinics. Through collaboration among policymakers, healthcare providers, and agricultural organizations, more effective protections for farm workers' dermatologic health can be established.

2. INCIDENCE OF CUTANEOUS MALIGNANCIES IN FARM WORKERS

2.1. Epidemiological Studies on Skin Cancer Prevalence Among Farm Workers

Multiple studies over the past 15 years show that U.S. farm workers face a notably high burden of non-melanoma skin cancers (NMSC) due to chronic sun exposure. A recent meta-analysis found that outdoor workers are 77% more likely to develop squamous cell carcinoma and 43% more likely to develop basal cell carcinoma compared to indoor workers [7]. Similarly, European data found farmers had over twice the odds of developing skin cancer [8]. A U.S. survey of nearly 8,000 Midwestern farm operators reported a skin cancer prevalence of about 10% [9], consistent with UV-related risk in fair-skinned outdoor workers [10,11]. Melanoma has also been observed at modestly elevated rates, particularly among female agricultural workers with a reported 18% higher rate than the general population [12]. U.S. data from the Agricultural Health Study found melanoma rates similar or slightly higher than average, with a notable increase among farmers' wives [13]. Some studies suggest chemical exposures may add risk—regular contact with pesticides or fertilizers was associated with a 30% increased skin cancer risk, even after adjusting for sun exposure [14].

These findings highlight the multifactorial nature of skin cancer in farm workers, where UV exposure is a main contributor.

2.2. Incidence in Farm Workers vs. the General Population

Compared to the general population, farm workers consistently show higher rates of skin malignancies, particularly NMSC [13]. A Wisconsin study found 34% of farmers with no

prior skin cancer were referred for suspicious lesions, compared to 22% of non-farmers [14]. Despite lower rates of internal cancers due to reduced smoking and pollution exposure, farmers reported greater skin cancer incidence from high UV burden [15]. This comparison underscores the occupational health impact of farming on skin cancer risk and the importance of targeted prevention efforts.

2.3. Geographical variations in prevalence

Regional UV intensity and sun exposure patterns influence skin cancer risk among farm workers. Those in low-latitude states like Florida and Southern California experience more year-round UV, increasing their risk for NMSC [16]. Data suggests that skin cancer rates increase with decreasing latitude among fair-skinned populations [17]. However, melanoma trends can defy latitude expectations. Northern states like Utah and Minnesota report some of the nation's highest melanoma rates, often attributed to recreational sun exposure and fair-skinned demographics [18]. Melanoma incidence among farmers' wives was elevated in Iowa but not in North Carolina, despite the latter's sunnier climate and more diverse population [13]. These findings suggest that region-specific factors beyond UV, such as genetics and behavior, also contribute. While national data is limited, current evidence shows the need for regionally tailored skin cancer prevention strategies in agricultural populations [18]. These geographical patterns highlight that prevention efforts may need to be tailored regionally.

Understanding regional differences is crucial for targeted public health interventions to reduce skin cancer incidence among U.S. farm workers nationwide.

3. RISK FACTORS

3.1. Occupational and Socioeconomic Factors Associated with Ultraviolet (UV) Radiation Exposure

Farmworkers are at increased risk of cutaneous malignancies due to prolonged ultraviolet (UV) radiation exposure and limited use of protective measures. In Eastern North Carolina, migrant workers often spend over nine hours daily in the sun, with only 9.2% using sunscreen and 12.6% wearing sunglasses regularly [19]. National surveys show similarly low rates of sun-protective behavior among farmworkers—15.1–21.4% for sunscreen use and 24.5–29.1% for shade-seeking [1]. In contrast, among the general U.S. adult population, 37.1% seek shade and

31.5% use sunscreen when outdoors for extended periods [20]. Barriers such as discomfort from protective clothing and reduced visibility from wide-brimmed hats deter farmworkers from adopting these measures [21]. These results highlight the necessity for education and policy initiatives aimed at decreasing skin cancer risk in this at-risk worker population.

3.2. Occupational and Socioeconomic Factors Associated with Chemical and Pesticide Exposure

Farm chemical exposure is a major contributor to high skin cancer rates in farmworkers. A meta-analysis of nine studies involving 184,389 individuals found that herbicide exposure raised the risk of melanoma (RR 1.85; 95% CI), and high pesticide exposure raised it even further (RR 2.17; 95% CI) [24]. Farmworkers who work daily with carcinogens like glyphosate and maneb/mancozeb have compounded risk when combined with sun exposure (OR 4.68; 95% CI) [25]. Despite these recognized risks, these chemicals remain in widespread use due to their efficacy as agricultural chemicals [26, 27], illustrating stark gaps in chemical safety regulations at the expense of workers' health. Though protective equipment reduces exposure, workers have no access or training in the use of most [28, 29].

In 2004, only 51% of tractors had rollover protective structures, while enclosed models reduce pesticide exposure 40-fold [30, 31]. These findings highlight the need for greater policy enforcement, worker training, and investment in safer agricultural methods.

3.3. The Role of Dermatologists in Skin Cancer Prevention and Early Detection

Mobile dermatology clinics and outreach initiatives are vital for increasing early skin cancer detection in underserved farming populations. Collaborations between dermatologists, cancer societies, and public health agencies enhance the effectiveness and sustainability of these programs. In the U.S., "The Sun Bus" provides free skin checks and sun safety education to vulnerable communities. Comparable programs abroad, such as Australia's SunSmart initiative and Ireland's "5 S's" campaign (Slip, Slop, Slap, Seek, Slide), have yielded measurable improvements in sun-protective behavior and skin cancer screening [39–41]. Mobile dermatology clinics and outreach initiatives ensure that underserved

communities have access to vital resources and services. Routine full-body exams by dermatologists remain the most effective, cost-efficient method for early detection. While biopsy is still the gold standard, advancements in dermoscopy and AI-enhanced image analysis have improved non-invasive diagnostics. [42]. Early identification facilitates treatment with topical therapies, cryotherapy, or surgical excision with narrower margins, thus improving outcomes and preserving healthy skin.

3.4. Promoting Sun-Safe Behaviors: Workplace and Public Health Strategies for Farm Workers

3.4.1. Workplace Intervention and Education

Educational outreach for high-risk populations, like agricultural laborers, should prioritize increasing awareness of UV-related health risks, promoting sun-protective behaviors, and encouraging early detection. Evidence-based guidelines support wearing long-sleeved clothing, wide-brimmed hats, and UV-blocking sunglasses; applying and reapplying broad-spectrum sunscreen (SPF 30+); seeking shade during peak UV hours (10 a.m. to 4 p.m.); and avoiding indoor tanning [32–34]. Regular skin self-examinations and timely consultation with dermatologists for suspicious lesions are also recommended [35]. Community-based interventions have proven effective in encouraging these behaviors. Strategically placed educational materials and messaging that highlights the financial burden of skin cancer, have been shown to effectively reinforce sun safety practices [23, 36]. These findings highlight the importance of targeted educational strategies that not only build awareness but also leverage practical, community-driven approaches to improving sun-protective behaviors. Furthermore, Reinau et al. reported that occupational sun-safety programs improve behaviors like sunscreen use and hat wearing [22]. Workplaces can contribute by scheduling breaks in shaded areas, adjusting work shifts to reduce midday sun exposure, providing portable shade structures and cooling stations, and partnering with occupational safety organizations to implement formal sun protection policies [1].

Employers play a pivotal role in mitigating UV-related health risks among high-risk occupational groups by establishing workplace policies, providing protective resources, and cultivating a culture of sun safety through education and structural support.

3.4.2. *Public Health Initiatives*

Public health campaigns are essential to raise awareness about the dangers of excessive sun exposure, including cutaneous malignancies, photoaging, and UV-induced damage. Studies show that many farm workers possess limited knowledge about UV-related risks and skin cancer, contributing to low uptake of sun-protective behaviors [32]. Dermatologists and primary care physicians, often the first point of contact for suspicious skin changes, should actively participate in these initiatives, particularly those targeting high-risk groups such as outdoor workers. Outreach should focus on vulnerable subgroups, including older, single males with limited education and income, as well as individuals with fair skin or a personal or family history of skin cancer [33]. Effective strategies for these campaigns include government subsidies for sun-protective products (e.g., sunscreen, hats, UV-protective clothing), community-led initiatives involving local healthcare professionals, routine screenings in agricultural communities, and culturally tailored education designed to build trust and engagement [37]. Notable examples of successful campaigns include Australia's "Slip! Slop! Slap! Seek! Slide!" and the United States' "Be SunAWARE," both of which promote comprehensive sun safety practices [38]. In summary, well-designed public health campaigns that are inclusive, targeted, and culturally sensitive play a crucial role in promoting sun-safe behaviors and reducing the burden of UV-related skin conditions, particularly among high-risk and underserved populations.

3.5. Barriers to Dermatologic Care Among Farm Workers

3.5.1. *Financial and Insurance-Related Obstacles*

Farm workers often face significant financial and insurance-related barriers that limit their access to dermatologic care. Many are uninsured, making routine screenings and preventive care largely inaccessible [43]. Even when insured, high costs, limited dermatologic coverage, and complex reimbursement policies often discourage timely care. [44]. Low-wage employment often lacks health benefits, increasing the risk of undiagnosed skin malignancies. Addressing these issues requires policy-level solutions. Expanding insurance coverage for farm workers and integrating skin cancer screenings into existing community health initiatives could significantly improve access.

Dermatologists can also play a proactive role by referring patients to such programs, helping to bridge the gap between financial hardship and essential dermatologic care.

3.5.2. *Cultural and Linguistic Barriers*

Cultural and linguistic differences pose additional challenges to effective dermatologic care for farm workers. A significant proportion of this workforce belongs to ethnically diverse backgrounds, including Latino, Indigenous, and immigrant communities [45]. These populations may hold health beliefs that diverge from mainstream medical models, impacting their engagement with preventive care services [46]. Communication barriers are particularly pronounced among non-English-speaking farm workers, and low literacy levels further complicate the delivery of health information [47, 48]. Many struggle to understand written materials, leading to poor comprehension of disease prevention and treatment strategies. Additionally, the lack of culturally appropriate educational content contributes to low awareness about the risks of prolonged sun exposure and its connection to skin cancer. To reduce these disparities, targeted interventions are needed. Expanding interpreter services, offering bilingual educational materials, and providing cultural competency training for dermatology providers can foster more effective communication and care delivery.

3.5.3. *Mistrust of the Healthcare System and Lack of Awareness*

Mistrust of the healthcare system is another significant barrier to dermatologic care, especially among immigrant farm workers. Fears of discrimination, mistreatment, or deportation often deter individuals from seeking medical attention for suspicious skin lesions [47,49]. Historical experiences of systemic racism and exclusion within the healthcare system have deepened this distrust, making timely access to dermatologic services less likely. Moreover, limited public health education about the dangers of UV radiation and the benefits of early skin cancer detection leaves many farm workers unaware of the need for routine screening. Misinformation and a lack of reliable, culturally sensitive educational resources further compound the problem.

To address these challenges, dermatologists and policymakers should collaborate on community outreach initiatives that build trust, increase awareness, and encourage timely care-seeking

behaviors, which can ultimately improve outcomes for this high-risk population.

3.6. Future Directions and Recommendations

To effectively address the growing risk of skin cancer among farm workers, a comprehensive strategy should focus on overcoming geographic and logistical barriers, improving healthcare access, promoting teledermatology, and advancing occupational dermatology research. Farm workers in rural areas face significant healthcare access barriers due to geographic isolation, limited transportation, and a shortage of dermatology providers. A recent workforce analysis found that 88% of rural areas in the U.S. lack access to a dermatologist, with a dermatologist-to-population ratio of approximately 423 per 100,000 individuals [50].

Rural residents travel 2-3 times farther for care than their urban counterparts [51]. To bridge this gap, solutions such as mobile health clinics for on-site screenings and teledermatology for remote consultations should be implemented alongside community outreach and education. Improving outcomes requires collaboration with agricultural groups to promote sun safety, training rural providers in dermoscopy, enforcing workplace sun protection policies, and supporting employer initiatives. These efforts must be reinforced by culturally tailored education and sustained public health outreach. Further studies should explore how psychological and socioeconomic factors shape care-seeking behaviors. Research in occupational dermatology is needed to assess prevalence, risk factors, and interventions. Longitudinal studies on combined UV and chemical exposures and the effects of workplace safety policies could inform prevention strategies.

4. CONCLUSION

Farm workers are uniquely vulnerable to increased risks of nonmelanoma skin cancer (NMSC) and melanoma due to chronic occupational exposure to UV radiation and agricultural chemicals. These risks are further exacerbated by limited access to healthcare and inadequate protective behaviors, driven by socioeconomic and geographic challenges. Dermatologists can help address these disparities by expanding mobile clinics and telemedicine services for rural populations to facilitate early detection and disseminate important information. Given that farm workers are predominantly ethnic minorities and immigrants, dermatologists need to provide inclusive care, utilizing culturally

sensitive materials and bilingual services. Public health initiatives, including mandatory sun safety training, better access to protective clothing, and stricter pesticide regulations, are essential for improving outcomes. Ultimately, protecting farm workers' dermatologic health requires collaboration among healthcare professionals, policymakers, and agricultural stakeholders to strengthen occupational health protections and promote primary prevention. Through these efforts, we can ensure that this essential, high-risk population is protected from preventable malignancies.

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