Master Thesis

Improving Early Recognition and Outcomes of Skin Cancer in People of Colour

Submitted by
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Declaration of Authorship:
I hereby declare that the submitted thesis is my own work. All direct and indirect sources are acknowledged in the references. This Master's thesis has not been used in the same or similar version to obtain any academic degree.

Khawla Alnuaimi Date: 25/9/2025

Abstract

Background

Skin cancer is one of the most common types of cancer and is strongly linked to exposure to ultraviolet radiation. While protective measures and screening may be valuable in promoting early detection and early treatment, disparities in skin cancer care are evident. Specifically, skin cancers are detected later and are more likely to be poorly treated or result in mortality in people with skin of colour (SOC). This may reflect a range of factors linked to populations and health information, highlighting an important inequity in care.

Aim

This review sought investigate strategies for improving the early recognition and outcomes of skin cancer in people with SOC.

Methods

A literature review was completed alongside selection of key case studies to facilitate translation of research to practice. The review included a concise search strategy focusing on English language, primary literature published from 2015 to 2025. Studies were refined using the preferred reporting items for systematic reviews and meta-analyses criteria and thematic analysis was used to combine data across studies.

Findings

A total of 20 studies were identified that met the inclusion criteria and underwent thematic analysis. Three main themes emerged, covering barriers to early identification and diagnosis, cultural beliefs and perceptions, and strategies to improve diagnosis and management of skin cancer in people with SOC. Overall, the findings suggested that key barriers included a lack of awareness of risk of skin cancer, poor knowledge of skin cancer and sun protection measures, cultural beliefs and norms, and lack of diagnostic skill and knowledge among healthcare professionals. Interventions such as tailored information provision and training for medical students/doctors showed some evidence of benefit in improving knowledge and supporting changes in behaviours.

Conclusion

This review highlights the importance of strategies to improve awareness, knowledge, and behaviours relating to skin cancer and sun protection among people with SOC. Recommendations to support improved diagnosis and outcomes include the need for tailored information strategies, support from healthcare professionals, and improvement in services and skills in cancer detection and management.

Contents

Introduction

Skin cancer is a common form of cancer, comprising a range of cancer types including melanoma, basal cell carcinoma (BCC), and squamous cell carcinoma (SCC) (Urban et al., 2021). Across populations, melanoma is one of the most dangerous forms of cancer seen in the general population, affecting over 325,000 people every year and resulting in 57,000 deaths per year, figures projected to increase over time (Arnold et al., 2022). The incidence of skin cancer has been increasing over time, reflecting a range of factors linked to climate change, human behaviours, and increased public awareness of cancer signs and symptoms (Rundle et al., 2020). One of the key challenges with skin cancer, particularly melanoma, is the mortality associated with the condition, particularly if presenting at a late stage (Apalla et al., 2017). Early-stage skin changes that characterise skin cancer (e.g., melanoma) include changes in colour, texture, border, shape, and size of existing moles (Apalla et al., 2017), while in *de novo* melanoma, where there is no association with moles, lesions may emerge with varying characteristics (Lin et al., 2015). Early diagnosis of melanoma is a crucial aspect of preventing the negative effects of cancer diagnosis on morbidity and mortality (Jones et al., 2020). Public health campaigns and the widespread use of sunscreen have led to more effective prevention of melanoma and driven earlier diagnosis in many populations (Rundle et al., 2020).

While the burden of skin cancer is a global phenomenon, this burden is not equally distributed across populations and ethnic groups (Arnold et al., 2022). It is recognised that skin of colour (SOC) has unique characteristics compared with Caucasian skin that may have implications for clinical conditions, including cancer risk (Bacorro et al., 2023; Hutchison et al., 2023). The definition of SOC in this context is generally based on the Fitzpatrick skin colour classification method, where lighter skin tones are defined as skin types I-III and darker skin types are classes IV, V, and VI (Gupta and Sharma, 2019). This method of classification is not without criticism, however, and may be limited by the methods used to initially classify skin colour (based on reaction to ultraviolet light) and then addition of categories V and VI to reflect those with darker skin pigmentation levels, rather than light reactivity of skin (Panda and Bandyopadhyay, 2022). However, the term SOC has become largely synonymous with reference to skin of people of Hispanic, African, Asian, Native American, and Middle Eastern descent, which broadly encompasses Fitzpatrick categories IV–VI (Panda and Bandyopadhyay, 2022). Furthermore, health disparities disproportionately affect this group of people (skin types IV–VI), reflecting the importance of focusing on this population (Fenton et

al., 2020). Therefore, people with SOC are defined according to the Fitzpatrick skin types IV–VI, while also reflecting the importance of focusing on the non-white population.

The incidence of skin cancer among people with SOC is lower than that seen in white/Caucasian people, which partly reflects the protective effects of melanin in the epidermal layer against the damaging effects of ultraviolet radiation (Rundle et al., 2020). Skin cancer diagnoses are more likely to be SCCs or BCCs in people with SOC, rather than melanomas (Lin et al., 2015). Factors associated with this difference may include lower levels of UV damage to skin compared with Caucasian populations, genetic predispositions, and behavioural factors (Gupta et al., 2016). However, despite the lower incidence of skin cancer in people with SOC, there is a notably high level of mortality associated with skin cancer in this population compared with Caucasian patients (Ezenwa and Buster, 2019). This suggests that people with SOC may be at risk of poorer outcomes when skin cancer is diagnosed, suggesting a range of potential factors underlying this observation. Several factors have been identified to account for this observation, including a delay in detection of skin cancer and delays in diagnosis (Davis et al., 2021). These delays may emerge for a range of reasons, reflecting patient and health professional behaviours and challenges in identifying tumours at an early stage (Brunsgaard et al., 2023a).

For instance, it has been noted that delays in recognition of signs and symptoms of skin cancer among patients may be a key factor delaying access to services and definitive diagnosis (Ezenwa and Buster, 2019). Factors linked to these include delays in diagnosis, lack of awareness, cultural beliefs, and biological differences (Brunsgaard et al., 2023a). The lack of recognition may reflect misconceptions regarding individual risk for skin cancer among people with SOC, where people believe they are ‘immune’ to skin cancer due to their melanin levels (Davis et al., 2021). Furthermore, people may lack awareness of the signs and symptoms of skin cancer in SOC, limiting the potential for early identification of lesions (Lunsford et al., 2018). Indeed, awareness of risk and the signs of cancer are commonly noted in non-Caucasian populations (Mesia et al., 2023). This includes awareness of the sites of presentation, which may be more likely to include non-sun exposed sites such as palms, soles, and nails, rather than sun-exposed sites in Caucasian populations (Gupta et al., 2016). Finally, it has been noted that there is a lack of diversity in skin cancer public health campaigns, which may limit the potential for education, knowledge, and behaviour change among people with SOC (Ezenwa and Buster, 2019).

Collectively, these risk factors may account for delayed help-seeking and presentation to services, resulting in lesion development and presentation at a late-stage, where treatment

may be less effective (Lunsford et al., 2018). Late-stage presentation, late diagnosis, and late treatment are associated with poor mortality and outcomes, potentially creating inequalities in skin cancer care for people with SOC (Brady et al., 2021; Shao and Feng, 2022; Shao et al., 2022). However, as well as challenges related to population awareness of skin cancer risk and presentation, it is recognised that delays in diagnosis and treatment may also be related to health service challenges and behaviours of healthcare professionals (Davis et al., 2021). For instance, clinicians may lack awareness of the specific risk and signs of skin cancer in people with SOC, reducing their potential to explore risk and to facilitate earlier diagnoses of the condition (Kailas et al., 2017). The interpretation of investigations, including dermoscopy, may also be unique in people with SOC in cancer contexts, posing challenges to clinicians lacking training or experience (Bacorro et al., 2023). Therefore, a situation arises where people may present with symptoms and signs or skin cancer that are overlooked or not diagnosed promptly, leading to later stage disease and more limited treatment efficacy (Kailas et al, 2017).

Given the multiple barriers seen in relation to early recognition and diagnosis of skin cancer in people of colour, interventions to promote improved care are necessary (Davis et al., 2021). There is a recognised need for improved strategies to identify skin cancer signs and symptoms earlier in SOC, including a need for increasing awareness and diagnosis among healthcare professionals (Peterknecht et al., 2022). Such strategies may have an impact on reducing inequalities in skin cancer outcomes across ethnic groups (Brunsgaard et al., 2023b). Furthermore, raising awareness and promoting education among people with SOC may be crucial in promoting earlier access to services and treatment for cancer (Peterknecht et al., 2022).

Aim

This research aims to investigate strategies for improving the early recognition and outcomes of skin cancer in individuals with SOC.

Research Questions

1. What are the current barriers to early recognition and timely diagnosis of skin cancer in individuals with SOC?
2. How do cultural beliefs and perceptions about skin cancer impact the willingness of individuals with SOC to seek medical attention?
3. What interventions or strategies can be implemented to improve awareness, early detection, and outcomes of skin cancer in SOC populations?

Methodology

Design and approach

The focus of this paper was on evaluating strategies for improving early recognition and outcomes associated with skin cancer in people with SOC. This encompassed the need to understand the underlying factors that are linked to poor recognition and diagnosis of skin cancer in this population, as well as the potential effectiveness of strategies to overcome these barriers and optimise outcomes. From a philosophical perspective, this aim highlights the limits of adopting a purely positivist or interpretivist paradigm (Bowling, 2014). Positivism seeks to understand reality through empirical observation and objectivity, which may have value in evaluating the effectiveness of interventions using objective criteria, but which may be limited in understand how cultural or social factors may drive healthcare access or cancer care (McCusker and Gunaydin, 2015). In contrast, an interpretivist approach would consider the subjective elements of this aim, such as individual perspectives and barriers, while failing to provide numerical or objective data supporting specific interventions or strategies (Creswell and Creswell, 2017).). Therefore, a pragmatist paradigm was adopted, which seeks to utilise the best available data to answer the question, maximising application to reality and a practical approach to problem-solving (Holloway and Galvin, 2016). This recognises the importance of objective findings in evaluating interventions, while also appreciating underlying subjectivity in how these may be applied and how effective they can be in practice (Heyvaert et al., 2016).

Consistent with the pragmatist paradigm, primary or secondary research methods may be adopted (Brannen, 2017). While primary research may be of value in this context, it was not considered feasible to collect data directly from participants due to time and cost constraints, as well as the need for ethical approval for such research (Creswell, 2014). Furthermore, there is already a body of literature on the topic which has not been effectively synthesised, potentially undermining the value of new primary studies that do not appreciate the background evidence to date (Heyvaert et al., 2016). The use of a secondary method was therefore justified to ensure a feasible approach to research and to provide a synthesis of evidence to date. The remainder of this chapter details the stages undertaken to complete the secondary method of a literature review on this topic, as well as the complementary value of illustrate case studies in supporting the relationship between research and practice.

Methods

This paper included both a literature review method and a case study method, with the intention of combing these elements to evaluate the contemporary evidence base and to relate those findings to the practice setting and personal experience of patient care in this context. This section focuses on the literature review method, including the search strategy, study refinement and selection, and analytical processes undertaken. This is followed by a separate discussion of the case study method.

Search strategy

The firsts stage of the literature review is to formulate a comprehensive search strategy to allow for identification of literature on the selected topic (Gerrish and Lacey, 2020). The first stage of the search strategy was to select suitable databases for the search, which were online journal databases containing peer-reviewed literature related to healthcare (Aveyard, 2023). The following databases were included in combination to maximise the potential number of hits from the search: CINAHL, Embase, PubMed/Medline, and Scopus.

A consistent search strategy was performed across the databases comprising selection of search terms, Boolean operators, and inclusion criteria (Fink, 2019). Search terms were derived from the key population, exposure, and outcomes of the review questions/aim, utilising key words from background literature and medical subject headings in the PubMed database (Aveyard, 2023). These terms were then combined using Boolean operators to allow for combinations of synonyms, as well as connections of search strings (Fink, 2019). The following search string was applied to all databases:

[skin of colour OR skin type IV OR skin type V OR skin type VI OR black OR African OR Latinx OR Asian OR Native Hawaiian OR Pacific Islander OR Indigenous] AND [cancer OR basal cell carcinoma OR BCC OR squamous cell carcinoma OR SCC OR melanoma] AND [recognition OR awareness OR barrier OR outcome OR diagnosis]

Inclusion and exclusion criteria were selected to refine the studies during the search process and to ensure they were relevant to the review topic (Aveyard, 2023). To be eligible for inclusion studies had to be published in English and from 2015 to 2025 to ensure a contemporary perspective on the topic. Only primary studies were included to ensure

minimisation of bias that may be present in secondary analysis/methodologies, including both qualitative and quantitative studies, consistent with the pragmatist paradigm (Brannen, 2017). Studies had to focus on skin cancer (melanoma, BCC, or SCC) in people with SOC, including any reference to barriers, diagnosis, identification, and treatment outcomes. People with SOC were defined according to the definition of Iwuala and Taylor (2022), including patients of various ethnicities and groups, as noted in the search terminology used in the review. Specific strategies evaluated included: targeted educational campaigns, community outreach programs, and culturally sensitive screening initiatives to improve early detection and outcomes of skin cancer. Full-text versions of all studies had to be included to ensure complete analysis of the study methods and data (Murad et al., 2016). Notably, studies were excluded if they focused on other cancer types, other populations, or adopted secondary methods.

Study refinement

The findings of the search strategy were assessed using a structured refinement process to ensure that only the most relevant studies were included in the final review data set (Murad et al., 2016). The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) criteria were used for this purpose, as this represents a structured and systematic approach to selection of studies (Moher et al., 2009). The first stage of the refinement process involved collating all of the studies identified across the databases and then excluding any duplicate entries, yielding the initial round of unique studies (Moher et al., 2009). The titles and abstracts of the studies were then perused to ensure relevance to the topic and adherence to the inclusion criteria, as a screening process. Finally, any remaining articles underwent a full-text assessment to confirm the relevance of the studies to the review. The result of this process was the final data set for further analysis and synthesis.

Critical appraisal

A key part of the analysis process in this review was determining the quality of the included studies and any potential sources of bias that may adversely affected the review findings (LoBiondo-Wood and Haber, 2017). A formal tool was used to facilitate the appraisal process, as this provides a consistent and reliable method of evaluating quality (Gerrish and Lacey, 2020). As the studies included could have a range of designs, the Critical Appraisal Skills Programme (CASP) toolkit was selected to facilitate critical appraisal, as this toolkit contains many tools specific to the design of different studies (CASP-UK, 2024). The appropriate tool

(checklist) was selected for the study design and completed to determine any sources of bias or methodological weaknesses in the included studies (Nadelson and Nadelson, 2014). Rather than generating a numerical quality rating, the CASP outcomes can facilitate a wider critical discussion of the key findings related to study weaknesses, integrating into the analytical process, as discussed below.

Data analysis and synthesis

The final stage of the review method is the analysis and synthesis of the literature (Aveyard, 2023). The analytical process involved data extraction using a standardised approach, such as a tabulated method, whereby key characteristics of the studies could be identified (Polit and Beck, 2018). These characteristics included the study author and data, design/method, sample and population characteristics, methods employed, outcomes assessed, and the key findings of the study. Following analysis of the individual studies, a thematic process was employed to combine and synthesis the findings across studies (Castleberry and Nolen, 2018). The framework of Braun and Clarke (2006) is widely used for thematic analysis of qualitative literature and has been utilised in review contexts to combine different types of data into narrative themes (Polit and Beck, 2018). The stages used in the analysis included reading the papers in their entirety, coding each paper to identify key terms/findings, comparison of the codes, development and refinement of themes of shared meaning across the studies, and then final checking and write-up of the themes into narrative discussions of the overall findings (Braun and Clarke, 2006).

Results

Overview of search findings

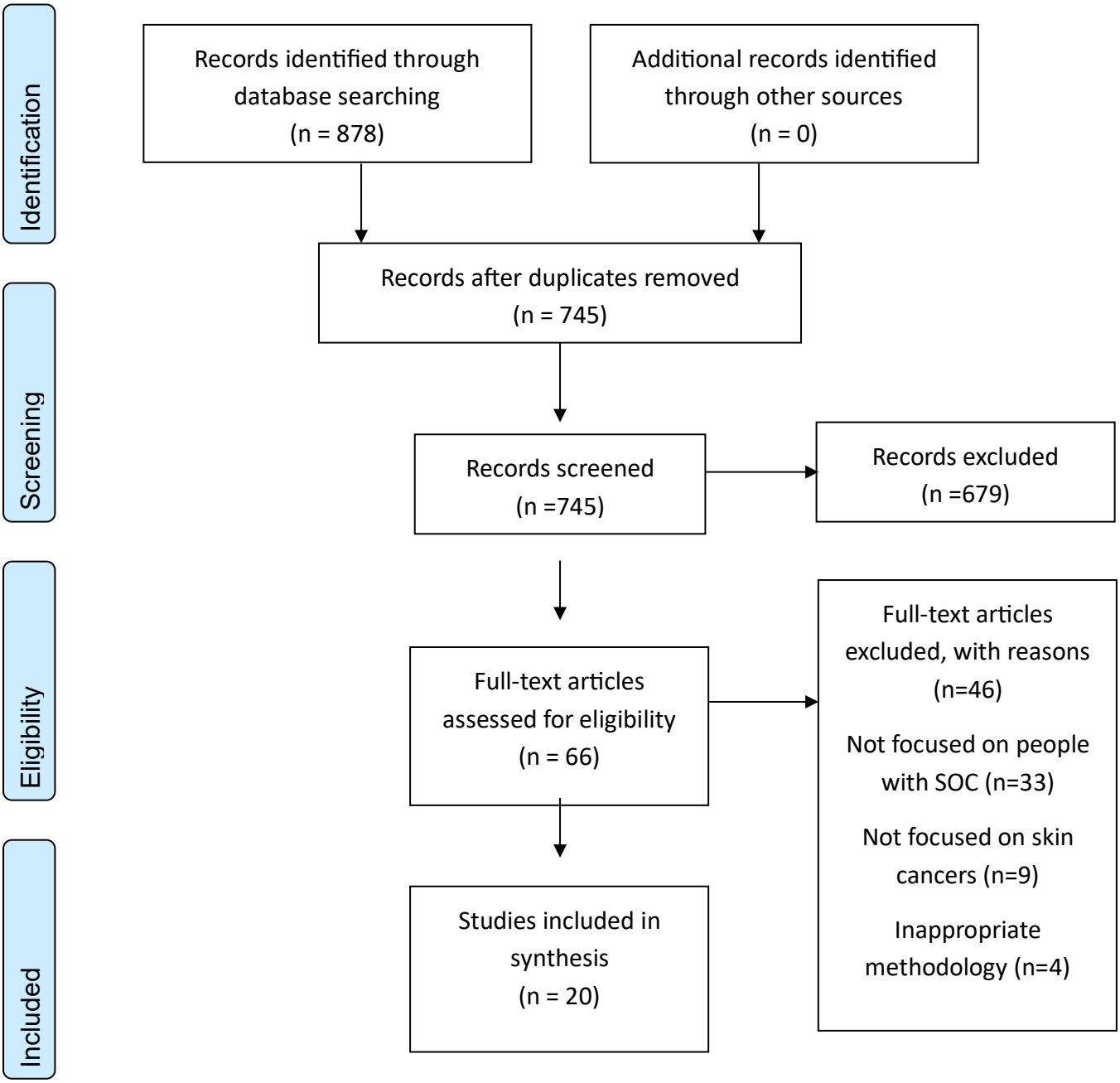
The search strategy initially led to identification of 745 studies across all of the included databases and when cross-referencing/snowballing was performed. Refinement of the data set led to a final data set of 20 unique studies on this topic. The refinement process is illustrated in Figure 1. Notably, studies were excluded on the basis that they were adopted secondary methodologies, did not focus on people with SOC, and focused on other types of cancer than melanoma, BCC or SCC.

Summary of included studies

The 20 included studies utilised a variety of methods, including both qualitative and quantitative designs; a summary of the studies is presented in Table 1. The qualitative studies were limited in number (n=3) but used a variety of methods to evaluate the perspectives of the participants, including interviews (de Vere Hunt et al., 2023), open-ended responses to questions (Crowder et al., 2023), and focus groups (Mesia et al., 2023). The quantitative studies generally used consistent methods for information collection, including cross-sectional questionnaires (e.g. Jacobsen et al., 2017; Besch-Stokes et al., 2023; Thomas et al., 2024). All reported outcomes were self-reported, and none were objectively defined by investigators or clinical observation/examination.

Populations included in the selected literature were diverse in nature and not consistent across the studies. For instance, studies evaluated African American or black populations (de Vere Hunt et al., 2023), Caribbean populations (Thomas et al., 2024), and Latin American populations (Besch-Stokes et al., 2023; Mesia et al., 2023). Other studies explored specific demographics or populations, and the details are included within discussion of the findings in the presented thematic analysis.

Figure 1. PRISMA flow diagram



Studies that explored potential strategies or interventions also showed significant heterogeneity in the methods employed and outcomes assessed. For instance, some studies explored perspectives of low socioeconomic status, uninsured, immigrant populations (Jacobsen et al., 2017; Jeihooni and Rakhshani, 2019), while many other studies did not define socioeconomic characteristics of the population or used mixed populations. Outcomes related not only to awareness, knowledge levels, or factors related to risk. but also changes in behaviour or intentions to change. These outcomes are discussed more extensively in the themes presented below.

Summary of critical appraisal findings

The CASP toolkit was applied to all of the studies, with selection of the tool (checklist) most appropriate to the study design. Overall, the findings of the critical appraisal process suggested that the studies had a moderate level of quality, with some important methodological weaknesses or sources of bias, specific to each study. The findings of the critical appraisal are considered for each study within the narrative analysis of the themes as a result. Notably, there was a range of issues or potential methodological issues with the included studies, although many of the biases may emerge due to selection of the population (i.e. non-randomised or unclear selection criteria), small sample sizes and uncertainty regarding the strength of any observed effects, and the issue of heterogeneity in defining skin cancers and people with SOC. These details are considered further for each study in the following themes.

Table 1. Summary of the included studies

Author and date	Design	Population	Data collection and outcomes	Key findings
Day et al. (2015)	Quantitative, cross-sectional	Asian young people living in Australia (N=140)	Survey Awareness, knowledge and link with skin tone for skin cancer	Tanning behaviours were linked to peers, family and media, with peers being the strongest influence; most females engaged in outdoor tanning; sun protection was linked to a desire for lighter skin tone; skin tone was associated with sun behaviours and perceived risk of cancer.
Roman et al. (2016)	Quantitative, quasi-experimental	Hispanic adults (N=86)	Online survey, educational video and follow-up surveys Changes in melanoma knowledge	Video exposure led to increased knowledge and awareness of melanoma and risk prevention strategies; skin examinations also increased in the intervention group.
Chao et al. (2017)	Quantitative, cohort study	Consecutive attendees at a dermatology clinic identifying as African American, Hispanic or Asian (N=100)	Survey Effectiveness of a melanoma awareness intervention script	The intervention improved melanoma knowledge, skin checking behaviours and perceived risk for melanoma over 2 months.
Jacobsen et al. (2017)	Quantitative, cross-sectional	Uninsured minority and immigrant adults (N=206)	Survey Awareness, knowledge and preferred outreach for skin cancer education	25.4% had not heard of skin cancer or melanoma; 20.7% believed their risk was zero; 58.2% rarely or never checked skin; video and text messages were popular outreach strategies
Tsai et al. (2018)	Randomised controlled trial	African American adults (N=143)	Survey Brochure or video educational intervention on sun protection,	Both groups showed comparable increases in knowledge, self-efficacy and sun protection behaviours

			knowledge and self-efficacy regarding melanoma	
Sanchez et al. (2020)	Quantitative, cross-sectional	Hispanic adults (N=285)	Survey Melanoma awareness	39% were unaware of melanoma; 65% knew signs of early disease; darker skin tone was associated with less knowledge; education level was linked to melanoma awareness
Banerjee et al. (2021)	Quantitative, cross-sectional	Ethnically diverse groups of family members in New Mexico (N=600)	Survey Family communication, knowledge and risks of skin cancer	77% reported discussing skin cancer with family and 66% skin cancer risks; doctors, family and friends were sources of skin cancer risk information; sun protection, family risk and screening were common topics of conversation; non-Hispanic status, higher income or education and higher perceived risk were among factors linked to greater family communication on skin cancer and risks.
Kim and Lwin (2021)	Quantitative, cross-sectional	Adult Singapore residents (N=1,021)	Online survey Cultural beliefs and influence on cancer fatalism	Cancer fatalism is associated with pessimism, naïve dialecticism and superstitions; fatalism is inversely linked to optimism; caner protective behaviours are linked to fatalism as a mediator of cultural beliefs, including sunscreen use
Ibraheim et al. (2022)	Quantitative, cross-sectional	Dermatology residents (N=125)	National survey Knowledge of evaluation of skin of colour	63.2% reported a programme that included skin of colour teaching; 60% were satisfied with their teaching; 56.8% reported the lowest knowledge levels for skin of colour diseases

Peterknecht et al. (2022)	Quantitative, cross-sectional, quality improvement project	Students and junior doctors (N=100)	Educational module and survey Teaching exposure, knowledge and confidence in skin of colour diagnoses	39% of students and 67% of junior doctors had no teaching on skin of colour; confidence in diagnosing in skin of colour increased with the module as well as knowledge scores.
Besch-Stokes et al. (2023)	Quantitative, cross-sectional	Hispanic adults from a single region (N=208)	Skin examination and questionnaire completion Knowledge, attitudes, perceived risk and sun protection practices	Hispanic adult had the lowest knowledge of skin cancer but a high desire to learn about it; sun protection practice was low (7.9%)
Crowder et al. (2023)	Qualitative	Hispanic adults in Floride and Puerto Rico (N=489)	Semi-structured interviews Retention and evaluation of genetic skin cancer risk	Skin examinations, sun protection and individual risk factor assessment were valued in both groups.
de Vere Hunt et al. (2023)	Qualitative	Black people in the United States of America (N=26)	Semi-structured interviews Evaluation of awareness of melanoma	Themes identified included: Lack of understanding of the term ‘melanoma’; low perceived skin cancer risk; unaware that melanoma occurs on palms and soles; lack of application of skin cancer messages for Black people; utilisation and relationship with health services is important
Kojder et al. (2023)	Quantitative, quasi-experimental	Multidisciplinary healthcare professionals (N=100)	Educational module and associated survey Diagnostic accuracy for skin conditions in skin of colour	Test scores correlated with specialism and skin types: lower diagnostic accuracy was seen in non-dermatologists and in darker skin; the educational module improved diagnostic accuracy but did not eliminate the disparity between light and dark skin evaluations.

Loginovic et al. (2023)	Quantitative, retrospective	Medical student-led public education project (N not reported)	Public education strategy Changes in perceptions and informal knowledge of skin cancer and conditions.	Public engagement can raise awareness of skin colour disparities in cancer diagnoses; no formal outcome evaluation was noted.
Mesia et al. (2023)	Qualitative	Latin American adults (N=176)	Focus groups Melanoma awareness and protection habits	Awareness of melanoma was low, but participants were keen to learn from trusted sources; lower risk was linked to brown or dark skin; social relationships influenced preventive practices; barriers to accessing health services (transport, costs and referral efficiency) were evident, particularly in low socioeconomic groups.
Rivera et al. (2023)	Quantitative, cross-sectional	Hispanic adults in Florida, USA (N=578)	Survey Beliefs, communication and information seeking on skin cancer	53% reported any communication about skin cancer risks or prevention; 31% sought information on risks; 21% sought information on preventive behaviours; female sex, perceived severity and lower health literacy increased communication.
Greene et al. (2024)	Quantitative, cross-sectional	Preclinical medical students (N=91)	Survey and test of medical images of skin conditions Confidence diagnosing dermatological conditions in skin of colour	No differences were seen in diagnostic skills for white or skin of colour images; students felt more comfortable diagnosing lesions in lighter skin.
Poondru et al. (2024)	Quantitative, cross-sectional	Adults from South Asian backgrounds (N=204)	Online forum questionnaires Perceptions of skin tone, sun protection and colourism	39.4% reported regular sunscreen use; 37.7% had minimal knowledge of skin cancer and almost half believed

				they are not at risk; social attitudes influenced perceptions of skin colour and sun habits.
Thomas et al. (2024)	Quantitative, cross-sectional	Jamaican patients in a single centre (N=180)	Survey data Melanoma awareness	Perceived melanoma risk was low; 37.5% did not know colour characteristics of lesions; 65% suggested low melanoma risk in Afro-Caribbean populations.

Themes of the literature

The thematic analysis process was completed using the framework of Braun and Clarke (2006), with a focus on combining the findings of the studies identified in the search process. This strategy led to the development of three main themes that aligned with the aim and objectives of the review. These themes focused on barriers to early identification and diagnosis of skin cancer, the role of cultural beliefs and perceptions, and strategies to improve diagnosis and management of skin cancer in people with SOC. Each of these themes is addressed in the remainder of this chapter, followed by illustrative case studies from practice to reinforce the relationship between literature findings and the practice setting.

Theme one: Barriers to early identification and diagnosis of skin cancer in people with SOC

One of the main barriers noted across studies was that the risk of melanoma may not be appreciated fully among people with SOC (de Vere Hunt et al., 2023; Thomas et al., 2024). For instance, the study by de Vere Hunt et al. (2023) was a qualitative evaluation of 26 African American or black participants from the United States. Qualitative insights from the interviews suggested that most of those interviewed did not feel at risk of melanoma. Similarly, Thomas et al. (2024) evaluated 180 people from Jamaica using a questionnaire that included assessment of meaningful knowledge of melanoma, which included an element of risk assessment and awareness. It was found that perceived risk was low in the Afro-Caribbean population, with 37.5% of respondents failing to appreciate colour characteristics of lesions and 65% suggesting that risk was low in Afro-Caribbean populations. This study did not include a more detailed evaluation of risk, however, which is a potential limitation. The qualitative study by de Vere Hunt et al. (2023) is also limited by the lack of exploration of risk and how this is perceived by participants, as well as the potential limitations of a small, qualitative study when attempting to generalise to wider populations of people with SOC. In addition, one study found that there was an expressed belief that darker skin cannot get skin cancer (Jacobsen et al., 2017), further providing insights into how risk is conceptualised in the population of people with SOC. Specifically, this study included 207 participants from an uninsured, immigrant community in the United States and found that 20.7% of those surveyed believed that people with darker skin colours cannot get skin cancer. While the majority of those surveyed identified this as a risk, the perception of no risk linked to cancer and skin colour was significant. These findings were derived from a low socioeconomic status group,

however, which may suggest that perceived risk is linked to education or economic status, which may inform knowledge and awareness on cancer topics; these variables were not explored by the authors (Jacobsen et al., 2017).

Other studies have explored the potential important of awareness and knowledge of skin cancer in relation to how risk may be perceived and early detection/diagnosis achieved. Poor awareness is demonstrated that melanoma may affect people with SOC, including awareness that this may affect lighter areas of skin such as lesions presenting on palms and soles (de Vere Hunt et al., 2023; Mesia et al., 2023; Besch-Stokes et al., 2023; Thomas et al., 2024). For instance, Mesia et al. (2023) reported in a survey of 489 Hispanic men and women that knowledge was a key area that could be improved to facilitate improvement in protective behaviours. Further studies clarify where knowledge may be targeted. For instance, in the qualitative study by de Vere Hunt et al. (2023), not only was the perceived risk of melanoma almost negligible among those interviewed, but there was a lack of awareness of how skin cancer may present in people with SOC, including the features of skin cancer, and understanding of the term 'melanoma' and what this means in terms of lesion characteristics, and surprise that palms, soles and nails can be affected by the condition. Similar findings were noted by Thomas et al. (2024), where knowledge of the term melanoma was relatively high, but awareness of melanoma risk was low, as well as features of presentations and how different body parts may be affected.

Two studies compared knowledge and awareness levels of people with SOC and other groups, providing a more robust assessment of whether this group is particularly prone to having less information on skin cancer than others. For instance, Sanchez et al. (2020) performed a cross-sectional survey of 285 participants, which included ethnic minority groups as well as white people. Overall, awareness of melanoma was at around 61% among all participants. However, knowledge levels were found to differ according to Fitzpatrick skin types, with skin types I and II showing a higher level of knowledge of melanoma as a form of cancer (86%) compared with skin types II and IV (46.3%) and skin types V and VI (57.6%). While these findings were not powered to detect significant differences, the authors did note that Hispanic participants were less likely to be aware of melanoma as a form of skin cancer than white people (P=0.0037). The study by Besch-Stokes et al. (2023) focused on a mixed ethnic population in the United States, with a predominance of Hispanic people (64.9%), and used a cross-sectional survey of the population (n=208) to assess knowledge and attitudes towards sun protection and skin cancer. The findings showed that skin cancer knowledge was lower among Hispanic people than other ethnic groups, but there was a desire to learn more about skin cancer among two-thirds of participants. This low level of knowledge may have

been linked to behaviours, as this group demonstrated a low level of self-reported sun protection practices among the ethnic groups studied, with only 7.9% using sunscreen regularly and only 22.0% always using sun protective clothing (Besch-Stokes et al., 2023). This study was based on a small total sample size, and, therefore, statistical differences between populations were not possible, but the findings do support a link between low knowledge of skin cancer and protective factors in a population with SOC, consistent with other studies in different ethnic groups (de Vere Hunt et al., 2023; Thomas et al., 2024).

It was noted that lack of awareness or knowledge may be partly related to a lack of information seeking or quality of available information. For instance, Besch-Stokes et al. (2023) found that there was a desire to learn more about skin cancer and sun protection in Hispanic members of the population, but limitations in how information could be accessed. Thomas et al. (2024) found that only a minority of those included in the study sought information on skin cancer from online sources, while trustworthiness of information was considered a challenge. While these findings may not be generalisable to other populations, they suggest that information quality and strategies to seek information may be an area for improvement for people with SOC.

Lack of knowledge of signs of cancer and challenges in identifying changes may also be associated with the potential for poor early diagnosis or detection (Jacobsen et al., 2017; Sanchez et al., 2020). For instance, it was noted that often people were unaware of the specific features of skin cancers in SOC and that aspects such as colour changes, location of lesions, and anticipated changes indicative of malignancy were often not clearly understood (de Vere Hunt et al., 2023; Thomas et al., 2024). In one study (Thomas et al. 2024) a concerning observation was made, where 56.4% of those completing the questionnaires did not perceive untreated melanoma as a potential risk to life. This lack of perception of the risk or consequences of melanoma may therefore be directly related to help-seeking and associated behaviours, reducing the potential to identify these cancers at an early stage or to facilitate therapy when changes are noted in lesions.

In summary, this theme provides important insights suggesting that skin cancer in people with SOC may be challenges to diagnose or detect partly due to poor risk perceptions, lack of awareness, and lack of knowledge related to skin cancers. These factors may be inter-related and can differ between ethnic groups, suggesting that there is a need to target specific awareness and knowledge of skin cancer among people with SOC.

Theme two: The role of cultural beliefs and perceptions related to skin cancer diagnosis in people with SOC

The second theme builds on the findings of the first theme and explores how cultural beliefs and perceptions related to a diagnosis of skin cancer may be influential in help-seeking and behaviours among people with SOC. Indeed, social and cultural norms may have an influence on awareness, knowledge, and risk perceptions, all of which were linked to the potential for poorer health behaviours and detection of skin cancers in theme one.

Perceptions related to the need for sun protection are an important potential driver of behaviours that can reduce the risk of skin cancer in people with SOC. Tsai et al. (2018) performed a randomised controlled trial examining strategies for improving sun protection behaviours and skin examinations among a population of African American people in the United States. When evaluating the baseline knowledge and attitudes towards sun protection and skin examinations in groups exposed to either brochure-based information or video interventions, the authors noted that there was a comparable level of low performance of sun protection, low knowledge, and lack of willingness or perceived need for sun protection (Tsai et al., 2018). Hence, the initial findings of the study population (N=143) supported the idea that sun protection and skin examinations may be perceived as unimportant or unnecessary in this population. Similarly, the study by Chao et al. (2017) found that baseline results of skin cancer risk perceptions and sun protection attitudes were generally lower among people with SOC than in other groups, suggesting that, prior to targeted intervention, this group may have a lower level of awareness or perceived need for protection.

While awareness and knowledge of sun protection and other behaviours linked to skin cancer may be important, there appears to be an important interplay between sociocultural norms and behaviours linked to skin cancer and sun protection (Day et al., 2015; Kim and Lwin, 2021). For instance, Day et al. (2015) evaluated the perceptions of sun protection and behaviours related to sun exposure among 140 young people in Australia who identify as Asian. The findings noted that tanning behaviours were influenced by sociocultural norms, with peers, family members, and media norms influencing tanning bed use and sun exposure. In contrast, the cultural desire for a lighter skin tone was linked to sun protection use and fewer incidents of sunburn. While the findings did not allow for a comparison with other groups, the findings suggest that behaviours related to sun exposure (and risk of cancer) may be influenced by social and cultural factors. Similarly, Kim and Lwin (2021) performed an online survey of 1,021 Singapore residents and noted that cancer fatalism was linked to cultural

superstitions, pessimism, and naïve dialecticism, which were defined as cultural beliefs. The use of sunscreen was one of the cancer protective features that was influenced by these beliefs, highlighting a specific link to skin cancer risk (Kim and Lwin, 2021).

In addition to more complex and broad cultural factors that influence skin cancer risk perceptions and sun protection behaviours, aspects of family communication have also been shown to more directly influence these factors. For instance, Day et al. (2015) found that family influences were important in risk assessment for tanning bed use in promoting skin tanning, where positive attitudes or common use of tanning beds led to positive attitudes and behaviours regarding their use in young adults. Similarly, family communication, risk perceptions, and sun protection behaviours were found to be linked in a study of 600 diverse Hispanic primary care patients from the United States, with differences noted between this group and white patients from the same region (Banerjee et al., 2021). In this study, most participants noted that family members were important sources of information regarding skin cancer, with 66% discussing cancer with family members generally. Conversations with family included those related to sun protection, personal cancer risk, time of sun exposure, and skin cancer screening; greater family communication on these issues were linked to higher health literacy, more proactive sun protection behaviour and higher perceived risk of skin cancer. Together, these findings show a link between family communication and information exchange about skin cancer and positive behaviours and knowledge, although the cross-sectional nature of the evaluation precludes any causative effects from being drawn definitively.

Hence, where family members are supportive and information is shared within groups, this may be a potential source of positive knowledge improvements and improved behaviours linked to skin cancer risk in people with SOC. Other studies noted the importance of information sharing and access in cultures and groups in order to realise the benefits of this communication, contrasting with sociocultural norms or traditions that may be harmful (Kim and Lwin, 2021; Rivera et al., 2023). For instance, an evaluation of 578 Hispanic adults who received skin cancer information leaflets/details on genetic risk showed that 53% sought information and communication about skin cancer from families or other sources. However, seeking information was more likely in those who perceived their own risk as high, had greater health literacy, and in females compared with males. Whether information sought from family members was helpful in evaluating risk further or in promoting health behaviours was not evaluated, however. Some cultural and social attitudes with cultures may have a potentially positive effect, reinforcing health behaviours and promoting sun protection. For instance, perceptions of skin colour, sun protection, and dermatological care within the South Asian community was assessed in one study (Poondru et al., 2024) and showed that while skin

cancer knowledge and perceived risk was low, cultural values with regards to health, beauty (lighter skin tone), and avoidance of tanning could have positive effects on sun protection. This is a complex issue, highlighting that cultural norms may be linked to potentially positive sun protection behaviours but may reside within damaging perceptions of beauty or body image (Poondru et al., 2024). Hence, it is important that healthcare professionals recognise potentially conflicting influences of culture and society on skin cancer and sun protection behaviours.

In summary, this theme highlights how cultural beliefs and perceptions related to the diagnosis of skin cancer can be influential in shaping behaviours and risk assessment in people with SOC. Specifically, cultural differences in information sharing, perceptions of skin cancer, perceptions of sun protection, and sociocultural norms may have a negative effect on risk.

Theme three: Strategies to improve diagnosis and management of skin cancer in people with SOC

The third theme focused on the potential for interventions or strategies to improve diagnosis and management of skin cancer in people with SOC, with potential evaluation of the effectiveness of these strategies in improving outcomes or care quality.

Jacobsen et al. (2017) reported that 58.2% of people rarely or never perform self-skin checks for cancers, highlighting the potential need to prioritise improving performance of self-checks through targeted interventions. Some studies evaluated the effectiveness of education campaigns in improving knowledge and performing skin examinations (Chao et al., 2017; Crowder et al., 2023). The study by Mesia et al. (2023) focused on an evaluation of the incorporation of genetic risk information in skin cancer prevention materials in Hispanic populations living in Florida and Puerto Rico. The findings showed that both populations studied found that the information contained in the written materials was clear and informative, with the materials being beneficial in improving knowledge, providing general information, increasing understanding of genetic risk, and facilitating improvement in sun protection. Responses from participants suggested that skin examinations would be conducted more regularly and that increased understanding of risk factors may lead to improvement in sun protection (sunscreen use and protective clothing). However, this assessment did not evaluate actual changes in observed behaviours and therefore it can only be inferred that changes in knowledge or intentions may have impacted actual sun protection and risk reduction.

Chao et al. (2017) evaluated 100 consecutive patients following a dermatology visit, including African America, Asian or Hispanic (self-identified) participants, with participants receiving a general information leaflet covering melanoma signs and symptoms compared with a targeted intervention comprising an information leaflet including a section on SOC and self-examination images. The targeted group showed an increase in perceived risk for melanoma post-intervention (P=0.015), but this difference did not persist at two months follow-up between groups. The targeted interventions also improved self-reported performance of skin examinations and knowledge of signs and symptoms of skin cancer at two months follow-up compared with the control group. While this was a small study, the findings suggest that information tailored to people with SOC may have added value than traditional information leaflets. A qualitative study by Crowder et al. (2023) also highlighted the value of materials that were culturally aligned and translated, to ensure information of relevance to people with SOC, which was preferred to generic information. Hence, information tailored to people with SOC may have particular value in improving knowledge and behaviours related to skin cancer.

Targeting awareness messages and campaigns at ethnic minority groups can be considered an important strategy to specifically address inequities in care related to skin cancer and people with SOC (de Vere Hunt et al., 2023; Loginovic et al., 2023; Greene et al., 2024). Loginovic et al. (2023) reported the results of a student-led public education project in the United Kingdom. This intervention was a public engagement strategy to address inequalities in skin care and dermatology for people with SOC. While this evaluation provides a top-line overview of the types of methods that may be used, including medical student-led stalls and information booths or direct public engagement, there was limited evaluation of the outcomes linked to such approaches. In the study by Jacobsen et al. (2017), outreach methods that were preferred by the sample population included videos and text messages (37.3% and 30.8%, respectively). Video and text messages/multimedia approaches to raising awareness may have value across populations and could enhance detection of lesions (Roman et al., 2016; Jacobsen et al., 2017). For instance, Roman et al. (2016) found that an online melanoma programme, comprising video education and tutorials, led to improvement in knowledge of self-skin examinations and melanoma among 86 Hispanic participants. However, this was not a controlled evaluation and therefore it was not clear if the benefits of the intervention were specific to the medium through which information was delivered. Tsai et al. (2018) found in a randomised controlled trial of 143 African American adults that exposure to either brochures or video information led to equal improvements in sun protection behaviours, knowledge of skin cancer, and self-efficacy in preventing melanoma or in monitoring for the condition ($P<0.05$ for all outcomes compared with baseline; $P>0.05$ for between group differences).

Therefore, multiple methods of information provision may be justified in these groups, with a focus on promoting education and information sharing the key priority.

In addition to practical outreach and support for diagnosis/detection, social support and education in low-income groups may also have some value in promoting more positive outcomes (Jeihooni and Rakhshani, 2019). The use of an eight-session training intervention targeted at Iranian farmers (n=100) versus a control group (n=100) showed that education on social support, sun protection, risk, and self-efficacy could improve knowledge and behaviours compared with a control group, with benefits persisting up to 6 months post-intervention (Jeihooni and Rakhshani, 2019). This study illustrates how a model of behaviour change (the health belief model) can be used to guide interventions and promote positive outcomes in a unique group of low socioeconomic status and high risk for skin cancer. Further studies would be needed to ensure the feasibility and efficacy of such tailored approaches on a population-specific basis.

Finally, this theme also highlights the importance of improving knowledge and awareness among medical professionals, as well as the population with SOC. The study by Greene et al. (2024) found that medical students scored low on an 18-question survey of images of skin conditions affecting people with SOC, but comparably with skin conditions in white populations. However, students identified lower confidence in cancer diagnoses in people with SOC and suggested the need for more education on this area, as well as resources.

For instance, it was noted that targeting knowledge of dermatologists and improving diversity in training may have value (Ibraheim et al., 2022; Kojder et al., 2023). A survey of dermatology residents in the United States found that only 11.2% had a dedicated SOC rotation and 63.2% had a dedicated SOC element to their training course (Ibraheim et al., 2022). The knowledge of diseases seen in SOC was lower than for other skin types (56.8%), and only 60% were satisfied with SOC education, suggesting that there remains a need to bolster education in this area (Ibraheim et al., 2022). The study by Kojder et al. (2023) evaluated an education module on SOC, which comprised a pre-test, lecture and post-test evaluations immediately and at three-months post-module. The results on 100 participants suggested that positive changes in diagnostic accuracy and confidence may be seen immediately and up to three months later ($P<0.05$). Whether long-term outcomes are impacted by a short-term intervention remains to be seen in terms of patient care quality. In addition to targeting qualified physicians, improvement of recognition of skin cancers and in training in undergraduates and postgraduates was also recognised as an important approach to improving detection, diagnosis and care of these cancers (Peterknecht et al., 2022). The study by Peterknecht et

al. (2022) evaluated educational interventions to improve knowledge and confidence in recognising skin conditions affecting SOC, including cancers. The assessment found that 39% of students and 67% of doctors did not receive SOC training, but, following the lecture, knowledge scores and confidence in diagnosis increased significantly in both groups ($P<0.001$). However, long-term results and changes in behaviour would need to be analysed to confirm the value of these training approaches.

In conclusion, the third theme highlights how targeted and tailored educational strategies may have some value in improving knowledge of skin cancer and sun protection among people with SOC. Furthermore, strategies aimed at improving recognition and diagnosis of SOC lesions and cancers specifically may have value among healthcare professionals and students.

Case studies

This section provides specific case studies of the presentation of skin cancer in people with SOC, providing a link between the research evidence and the clinical presentations seen in actual practice.

First, it is prudent to note personal experience of a melanoma case seen during my residency, prior to knowledge of dermoscopic. The patient was a 63-year-old male, skin type VI, with a persistent lesion over the heel (pictures not available). The patient was seen after visiting several dermatologists who treated the lesion as a wart for almost one year with cryotherapy. On this presentation, the attending physician attempted to curettage the lesion which revealed black pigmented layers. A skin biopsy was performed to rule out acral melanoma. Histopathology showed an invasive melanoma (Figure 2). Surgical excision was performed, and sentinel lymph node biopsy was completed.

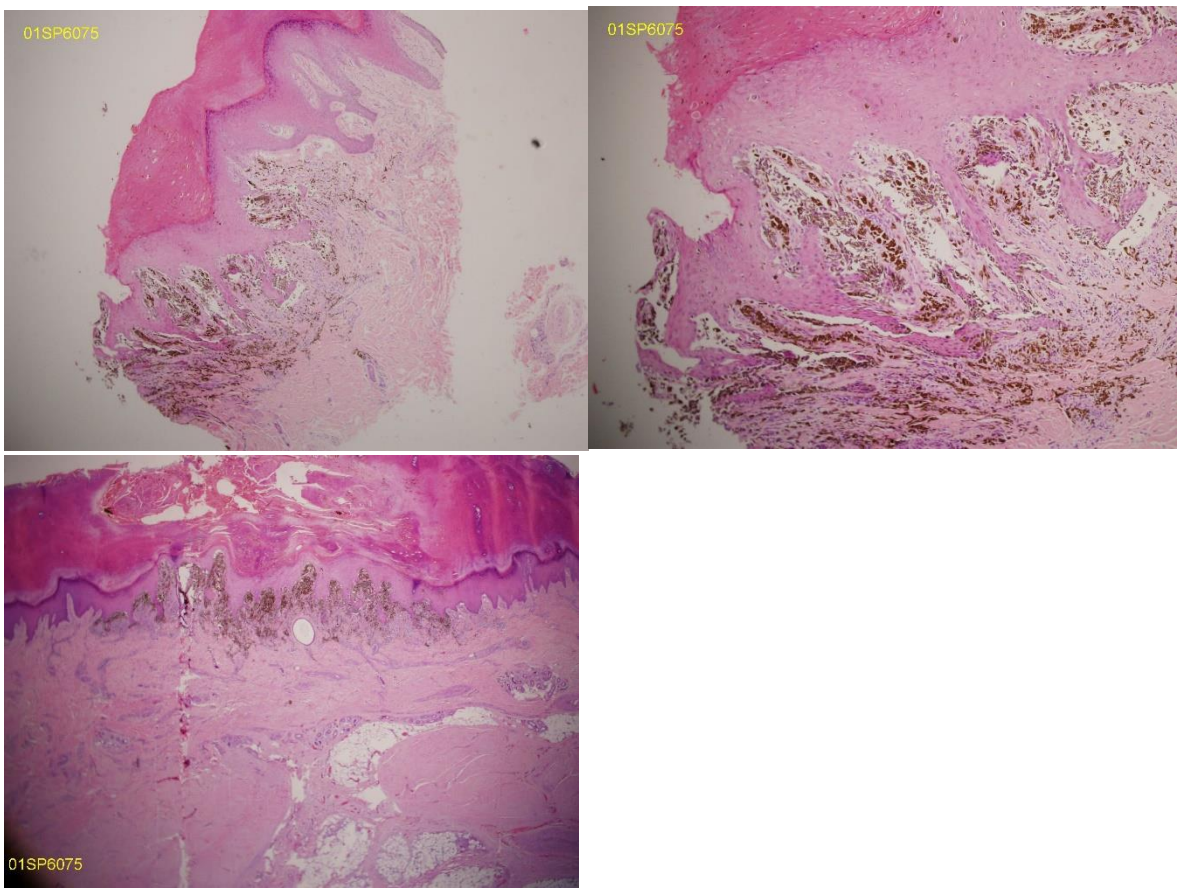


Figure 2. Histopathology slides of an invasive melanoma.

For the remaining cases, clinical histories are presented with their respective clinical presentations and dermoscopic findings. These cases reflect those seen in clinic after attending dermoscopic courses, which has improved my knowledge and confidence in the formulation of a management plan.

Case 1

A 38-year-old male with skin type V presented with a persistent lesion on the left forearm for several years. Dermoscopic examination revealed a dark brown peripheral network with central scar-like depigmentation (Figure 3). Although reassured about the benign nature of the lesion, the patient opted for surgical removal due to aesthetic concerns. The lesion was excised via punch biopsy, and histopathological evaluation confirmed dermatofibroma diagnosis.

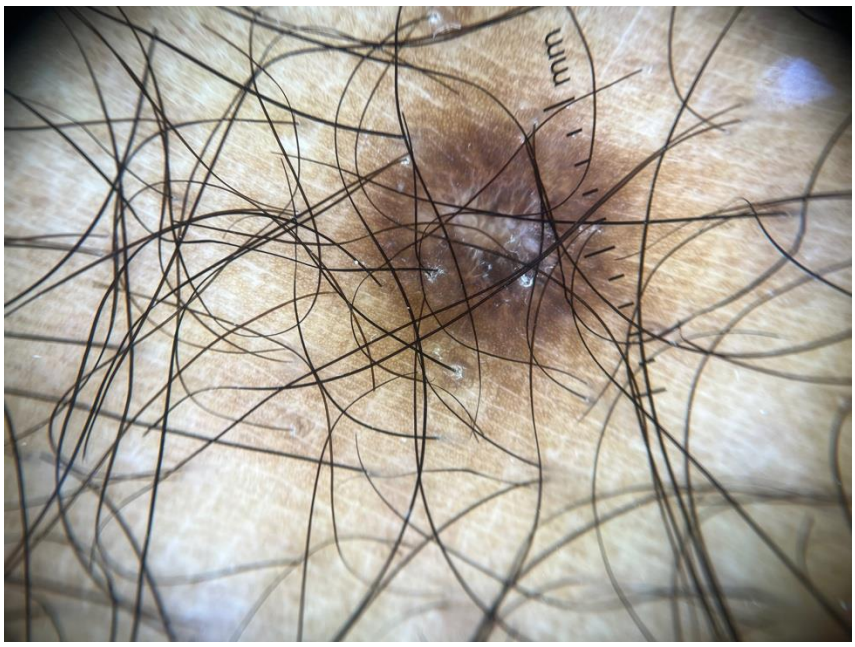


Figure 3. Lesion characterised by a dark brown peripheral network and central depigmentation in dermatofibroma.

Case 2

A 32-year-old male with skin type IV presented with a persistent lesion on the left leg, expressing concern about its nature. Dermoscopic evaluation demonstrated a brown reticular structure with central scar-like depigmentation, consistent with dermatofibroma (Figure 4). The patient was reassured regarding the benign characteristics of the lesion.

Figure 4. Dermatofibroma with Reticular lesion with central scar-like depigmentation.

Case 3

A 33-year-old female with skin type IV presented with a long-standing lesion on the buttock. Dermoscopic examination revealed a reticulated structure with a pink and scar-like structureless centre (Figure 5). The findings were considered characteristic of dermatofibroma, and the patient was reassured accordingly with no need for further treatment.

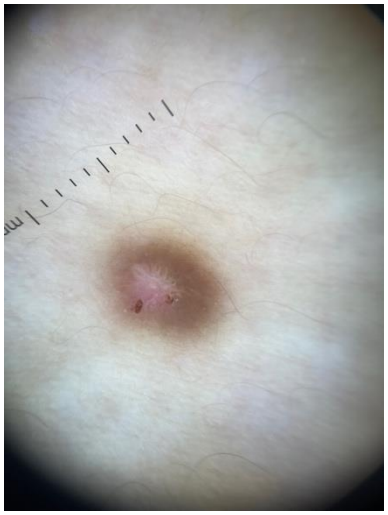


Figure 5. Dermatofibroma with a reticulated structure and pink, scar-like structureless centre.

Case 4

A 40-year-old female with skin type IV presented with an asymptomatic lesion on the leg, persisting for several years. Dermoscopic examination revealed brown reticular pigmentation with a central pink structureless area studded with glomerular vessels (Figure 6). As the lesion had remained unchanged over time, the patient was reassured of its benign nature, consistent with dermatofibroma.

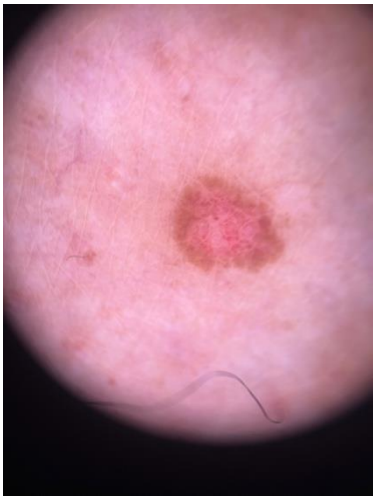


Figure 6. Dermatofibroma with brown reticular pigmentation and a central pink structureless region.

Case 5

A 38-year-old female with skin type IV presented with a persistent lesion on the left leg. Dermoscopic findings included hyperpigmented reticular structures surrounding a central scar-like linear pattern, consistent with dermatofibroma (Figure 7).

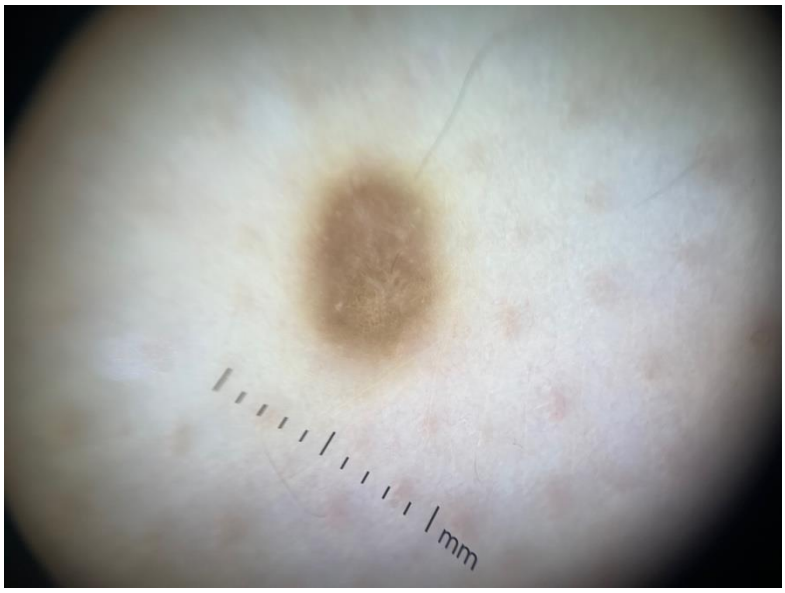


Figure 7. Dermatofibroma with hyperpigmented reticular structures

Case 6

A 19-year-old female with skin type IV presented with a mole on the left hand, which she had observed for several months but did not recall having previously. She had no significant medical history. Dermoscopic examination revealed pigmentation in the furrow with a lattice pattern, consistent with a benign acral nevus (Figure 8). The patient was reassured and scheduled for reassessment in six months to monitor for any changes.

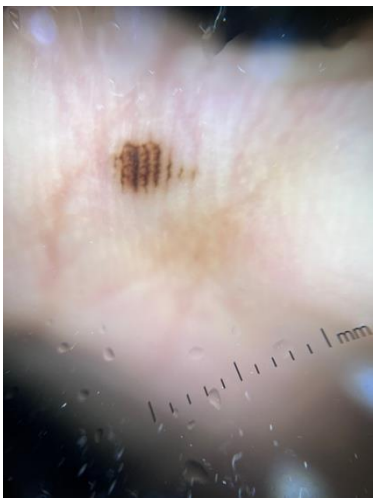


Figure 8. Benign acral nevus with pigmentation in a lattice pattern.

Case 7

A 13-year-old female with skin type IV expressed concern about a nevus on her back. Dermoscopic examination showed a symmetrical light brown reticular network, characteristic of a benign nevus (Figure 9). The patient was reassured of its benign nature.

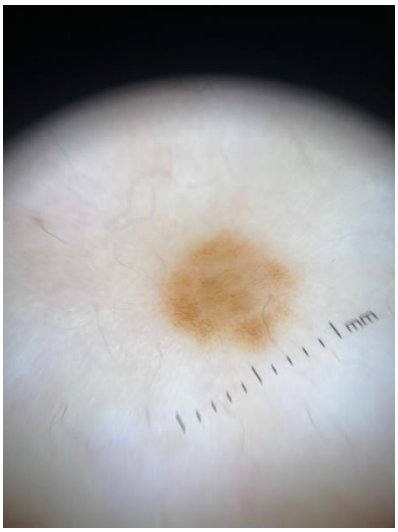


Figure 9. Benign nevus with a light brown reticular network.

Case 8

A 12-year-old girl with skin type IV was brought by her mother due to a palpable growth on the scalp. Dermoscopic examination demonstrated a brown cobblestone pattern with central lighter globular structures, consistent with an eclipse nevus (Figure 10). The patient was reassured.

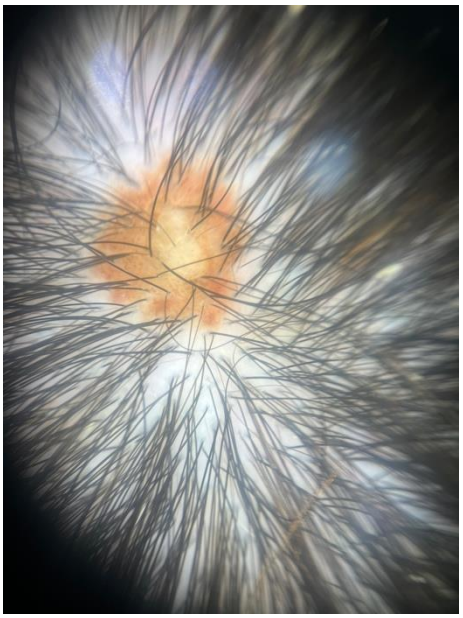


Figure 10. Characteristic eclipse nevus of the scalp.

Case 9

A 29-year-old female with skin type IV had a long-standing pigmented lesion on her left forearm, present since childhood and unchanged over time. Dermoscopic examination revealed a uniform structureless blue pigmentation, characteristic of a blue nevus (Figure 11). Given its stability over the years, the patient was reassured of its benign nature.

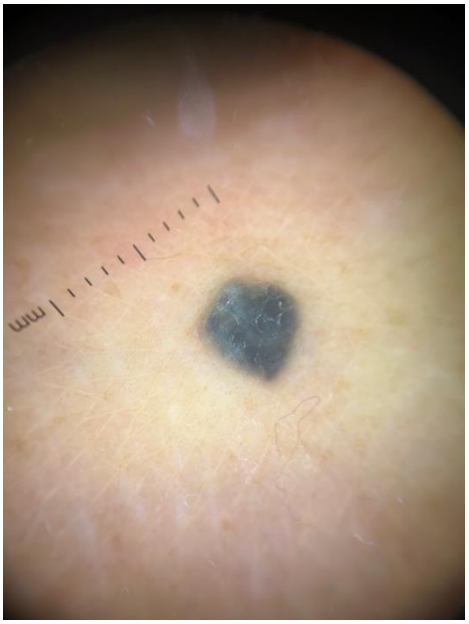


Figure 11. Blue nevus on the left forearm, with characteristic uniform blue pigmentation.

Case 10

A 29-year-old male with skin type IV presented with an 18-month history of a newly developed mole on the right forearm. The lesion had increased in size over several months before stabilizing over the past year. Dermoscopic evaluation revealed a dark brown thick network with a jagged border, asymmetrical along one axis (Figure 12). Due to the lesions suspicious features, a skin biopsy was strongly recommended. However, the patient repeatedly cancelled his appointments and was lost to follow-up.

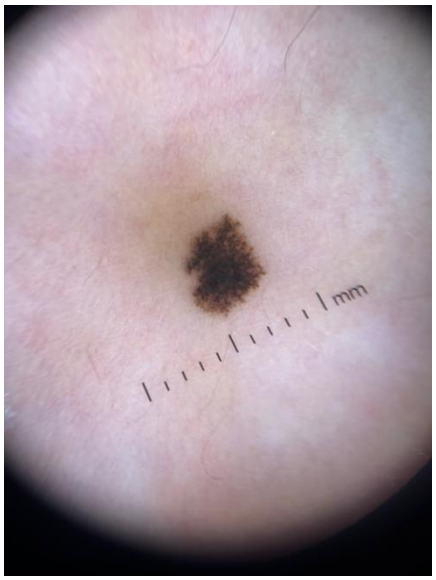


Figure 12. Suspicious melanocytic lesion with a dark brown pigmentation and irregular border.

Case 11

A 12-year-old male with skin type IV was brought by his mother due to a pigmented line on the left thumbnail, present for several years. Dermoscopic examination showed a 2mm-thick pigmented line with regular parallel lines, maintaining uniform thickness from the proximal to distal end (Figure 13). Given the patient's age, the findings were suggestive of a benign melanocytic nevus involving the nail. The mother was reassured accordingly.

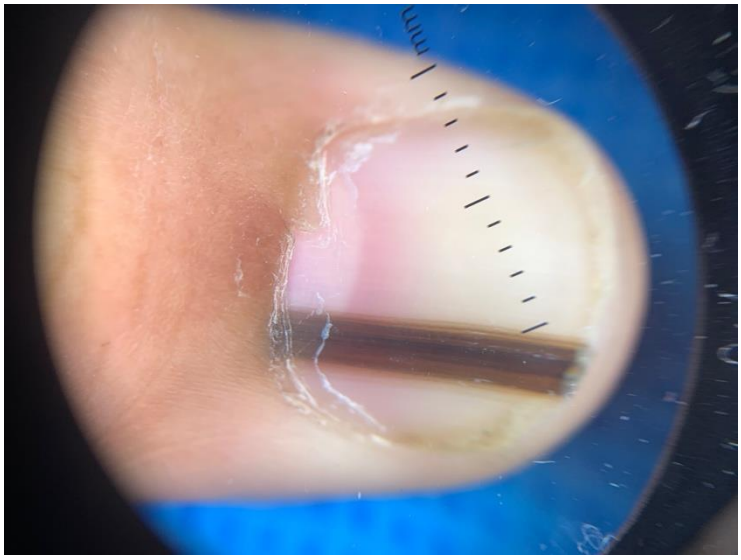


Figure 13. Benign melanocytic nevus of the nail.

Case 12

A 64-year-old female with skin type III presented with a pigmented line involving more than 50% of the nail plate, showing brown lines of varying widths with Hutchinson's sign at the proximal nail fold. Dermoscopic findings raised suspicion for melanoma (Figure 14). A nail biopsy confirmed melanoma *in situ* (case provided by Andreas Blum.)

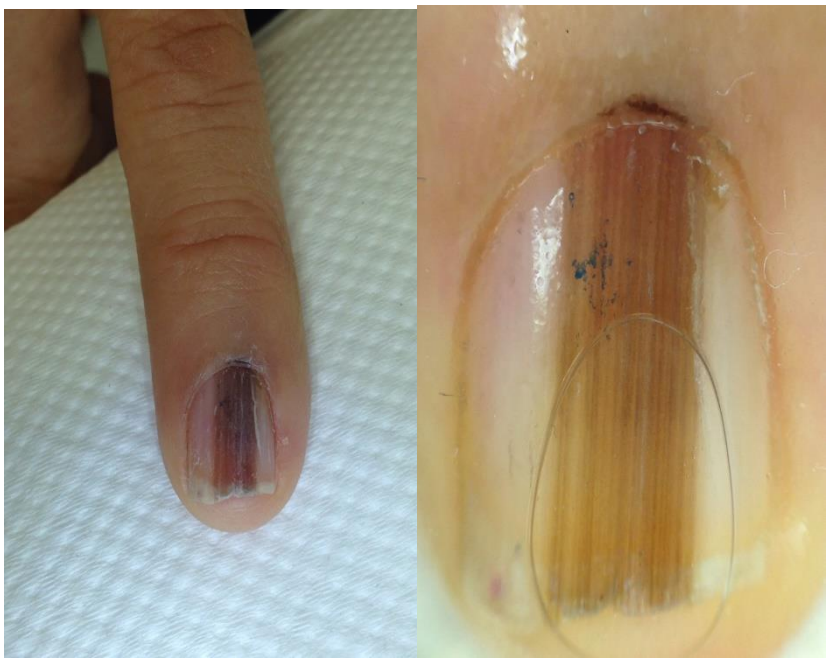


Figure 14. Melanoma *in situ* of the nail bed.

Case 13

A 17-year-old male with skin type V, with no significant medical history, presented with nail pigmentation on the right thumb. Dermoscopic examination of all nails revealed bilateral grey pigmentation affecting the thumbnails (Figure 15). As multiple nails were involved and the colouration was grey, the parents were reassured that this finding was most likely benign melanonychia, common in individuals with darker skin tones.

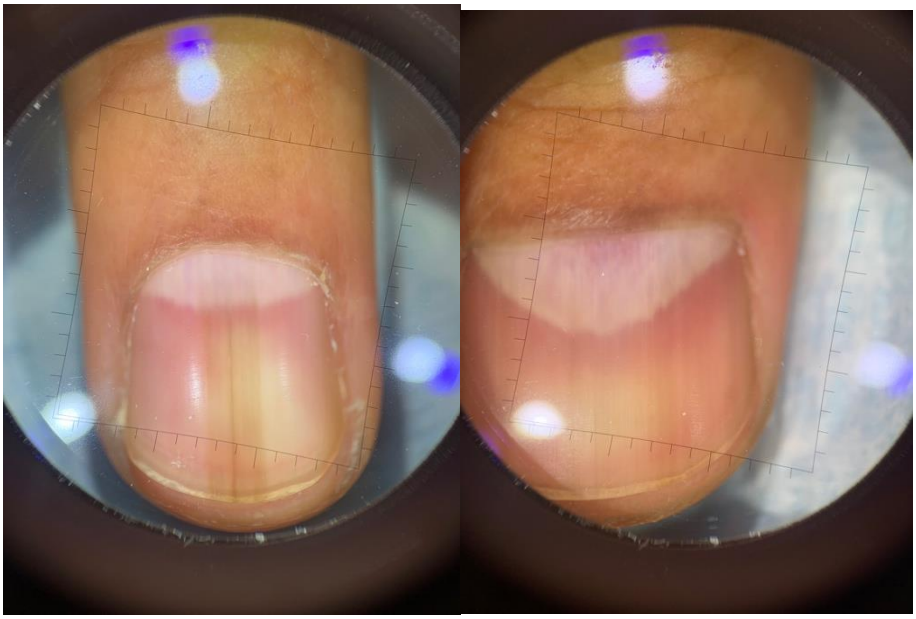


Figure 15. Benign melanonychia with bilateral grey pigmentation involving the thumbnail.

Case 14

A 26-year-old female with skin type VI presented with concern regarding a pigmented line on the right ring finger. Examination showed pigmentation changes over several fingers (Figure 16). The right ring finger exhibited two linear dark brown pigmented bands (each 1mm in width), while the middle finger displayed a pigmented ridge pattern (Figure 16). Multiple pigmented macules and patches were observed across several fingers with similar dermoscopic features. Despite the ridge pattern, given the involvement of multiple fingers in a patient with dark skin, the findings were most likely due to ethnic pigmentation.

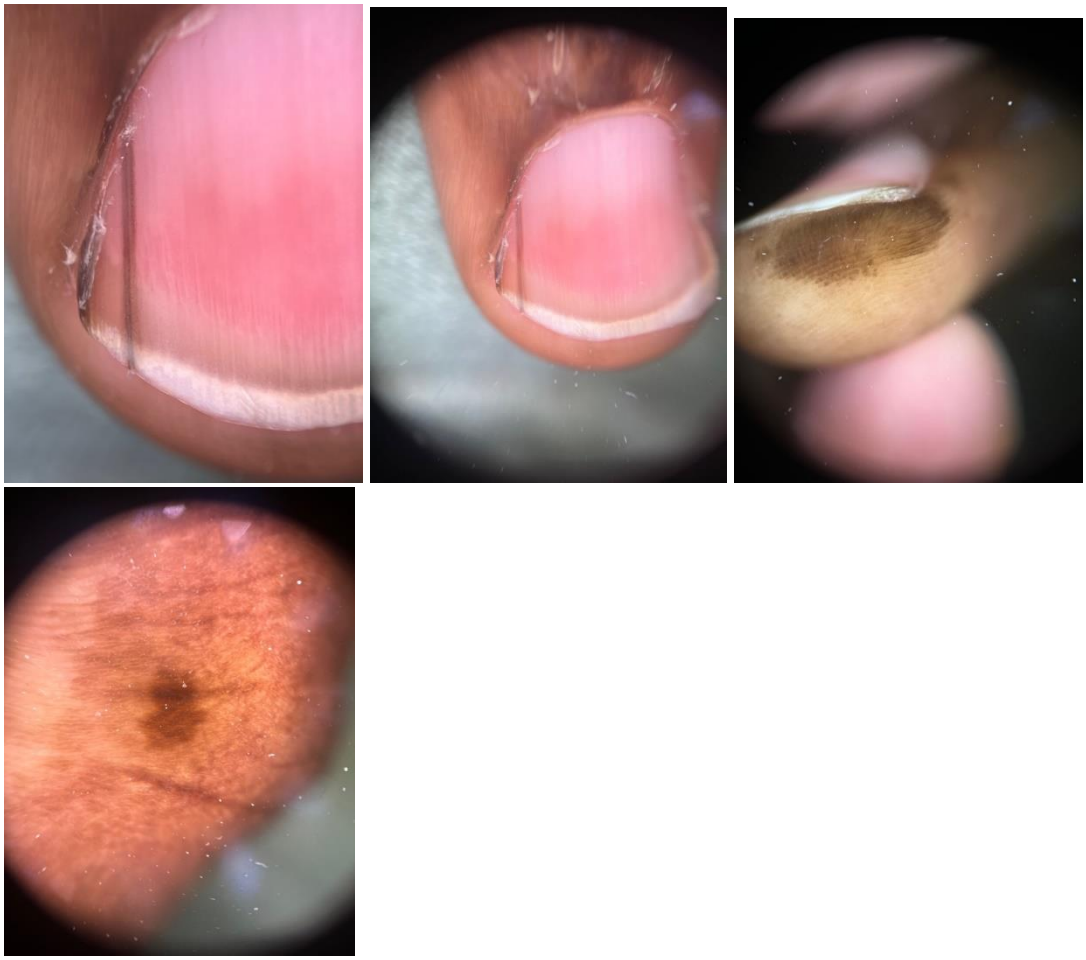


Figure 16. Evident linear pigmentation bands and ridge patterning, with macules and papules on the fingers.

Case 15

A 72-year-old male, with skin type IV, presented with multiple pigmented growths on the face. The lesion showed characteristic of gyri and milia-like cysts, which is consistent with seborrhoeic keratosis (Figure 17).

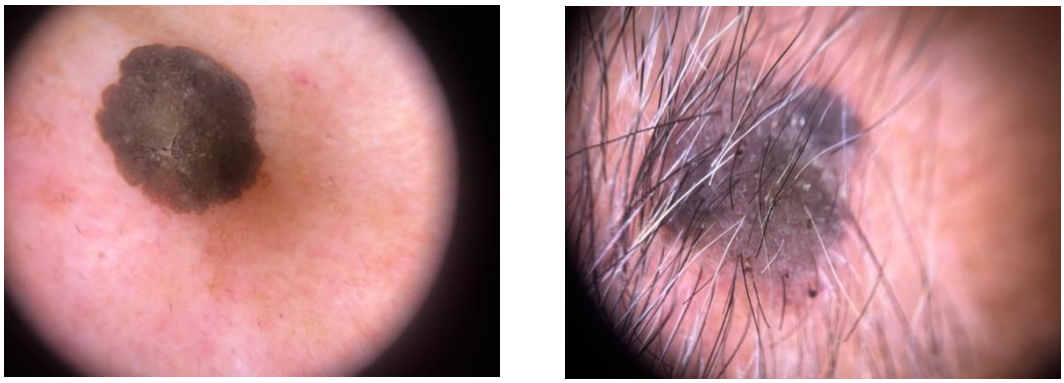


Figure 17. Seborrhoeic keratosis with gyri and milia-like cysts.

Case 16

A 69-year-old male, with skin type V, presented with a verrocus growth over the temple. Dermoscopic examination showed gyri and a comedo-like opening, consistent with seborrhoeic keratosis (Figure 18).

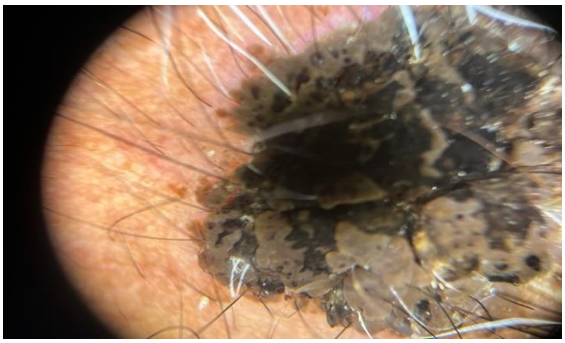


Figure 18. Seborrhoeic keratosis with gyri and a comedo-like opening.

Case 17

A 36-year-old female, with skin type IV, presented with pigmented macules over the lips. She has a sister with similar lesion. No pigmentaion was seen in genital area. Past medical history is significant for recurrent abdominal pain. Dermoscopic imaging revealed light to dark brown pigmented strutureless areas with no variation in colours (Figure 19). Differential diagnosis was normal ethnic pigmintation or Peutz-Jeghers syndrome due to the presence of abdominal pain. The patient was referred to gastrointerology for review and assessment.

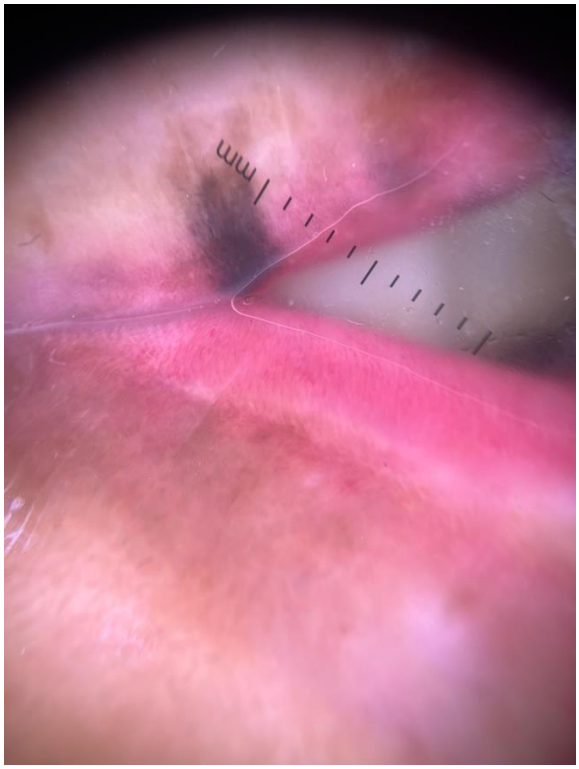


Figure 19. Light to dark brown lesion on the lips potentially due to ethnic pigmentation or Peutz-Jeghers syndrome.

Case 18

A 6-year-old girl known to have xeroderma pigmentosum presented with recurrent bleeding lesions on the lips. A full skin exam revealed concerning lesions on the lips. Dermoscopy revealed red, white and dark brown structureless areas, with variations in colours (Figure 20). A biopsy was discussed with the parent of the patient but this was refused in hope for a resolution to the problem. The patient was booked for monthly re-assessment every, with no significant changes for the past 6 months.

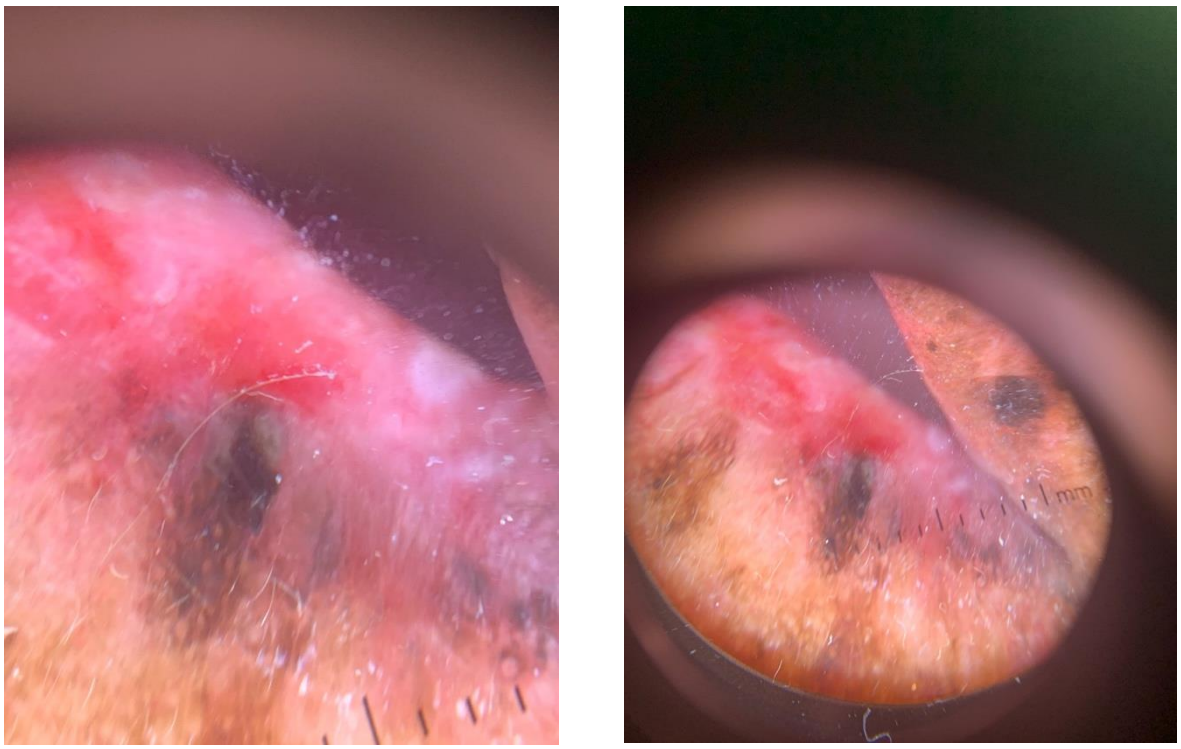


Figure 20. Lesions with variable colours and structures affecting the lips.

Case 19

A 64-year-old female, with skin type V, presented with a 20-year history of skin growth on the scalp. Presentation was due to the growth bothering her while combing the hair. On examination she had a 2.7 x 2.5 cm diameter exophytic growth with ulceration and crusted areas. Dermoscopy showed ulceration, linear vessels, and blue and white clouds (Figure 21). Surgical excision was performed, and pathology showed central areas with necrotic debris, shadow cells, with transition to squamous cells. The lesion showed connection to the epidermis with surface ulceration, with no evidence of lymphovascular or perineural invasion. Immunohistochemistry showed the tumour cells to be diffusely and strongly positive for CK7, BerEp4 and P40. The Ki67 proliferation index was high. The differential diagnosis was basal cell carcinoma with squamous and matrical differentiation or pilomatrix carcinoma; the former is favoured.

Figure 21. Suspected basal cell carcinoma with squamous and matrical differentiation.

Case 20

A 77-year-old male, with skin type IV, presented with a 2-year history of skin growth on the nasal bridge. He has visited several physicians over this time and cryotherapy was performed. He requested another session of cryotherapy. Examination showed a 2 x 2cm diameter exophytic growth. Dermoscopy showed a large keratinous structure surrounded by erythema with white clouds (Figure 22). The lesion was excised, and pathology results showed an invasive well-to-moderately differentiated squamous cell carcinoma.

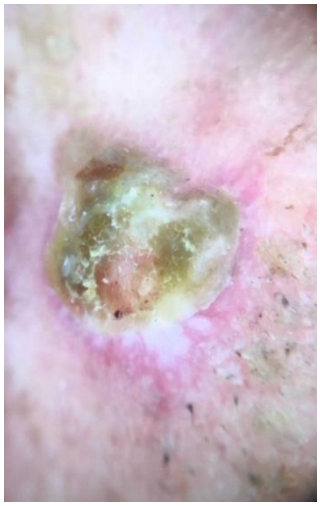


Figure 22. Squamous cell carcinoma on the nasal bridge.

Case 21

A 48-year-old female from the Philippines, with skin type III, presented with a 1.8mm pigmented lesion on the trunk (Figure 23). Dermoscopy showed a blue-black colour with white angulated lines. The diagnosis was invasive melanoma with 1.8 mm tumour thickness (case provided by Andreas Blum).

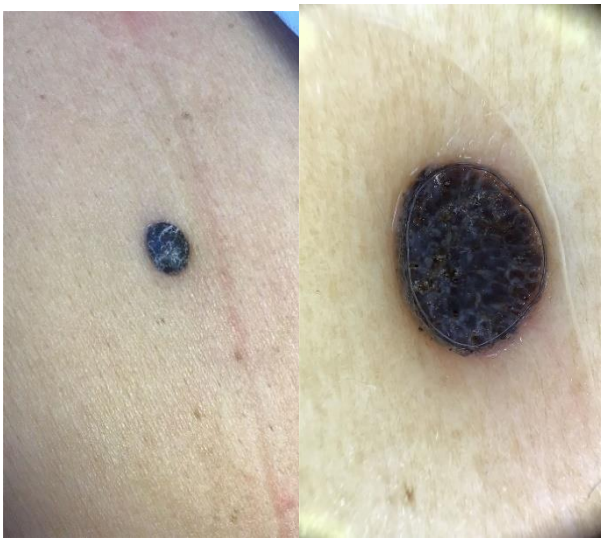


Figure 23. Invasive melanoma with 1.8 mm tumour thickness on the trunk.

Case study discussion

The cases presented in this discussion highlight the heterogeneity in the presentation of skin cancer lesions in people with SOC. The initial cases highlight an important series of features that may be consistent with benign lesions, including seborrheic keratosis, benign nevi, and dermatofibromas. However, heterogeneity in the characteristics of benign lesions may lead to challenges in differentiating them from malignant lesions without more detailed examination and investigation (Ezenwa et al., 2021; Ankad et al., 2023).

Dermoscopic features of key lesions in people with SOC are diverse. For dermatofibroma, some key findings include a characteristic scar-like area of whitening within the pigmented lesion with shiny white crystalline structures, network-like structures or ring-like globules (Ezenwa et al., 2021). In cases of seborrheic keratosis, the presentation may range in the degree of pigmentation from light to dark brown but there are often many features consistent with the presentation (Ezenwa et al., 2021). This includes the presence of hairpin blood vessels and a white halo, comedo-like openings, milia-like cysts and network or fingerprint structures, without any signs of atypical or malignant change (Sun and Halpern, 2022).

Furthermore, benign nevi in people with SOC are often symmetrical and have regular borders with consistent pigmentation, but this may not be the case for all presentations (Ezenwa et al., 2021). Nevi may be more prone to dermoscopic variation in people with SOC compared with those with lighter skin, including the presence of blue-grey pigments, the presence of reticular patterns and central hyperpigmentation (Ezenwa et al., 2021).

The first case discussed highlights how identification of malignant lesions may be challenging in people with SOC for practitioners. In the presented case, the patient had visited several dermatologists who initiated cryotherapy for lesion treatment, thinking it was a wart. The lesion was persistent in nature, over the heel, and was pigmented - black pigmented layers were noted on presentation, and it took a biopsy and histopathology examination to identify the lesion as invasive melanoma. This highlights how relatively benign features of a lesion may lead to diagnostic uncertainty and inappropriate treatment without a high index of suspicion (Fahmy et al., 2023). Even where there was some diagnostic suspicion of malignancy among patients, one case study highlighted how delays may occur due to loss of patient to follow-up (Case 10). Furthermore, diagnostic delays, as seen in a patient undergoing inappropriate cryotherapy for a suspected wart that was an invasive melanoma, may increase the risk of delayed diagnosis and poor outcomes (Enechukwu et al., 2023).

Presentation of invasive melanoma across case studies tended to reflect heavily pigmented lesions with some degree of growth or instability, often with evidence of asymmetry (Ankad et al., 2023). This is broadly consistent with the findings of a retrospective analysis of skin cancer cases among black individuals (n=165), where cancerous lesions were classically pigmented (Manci et al., 2022). However, the locations of the lesions included the trunk (Case 21), forearm (Case 10), and heel, suggesting that any region may be affected. In one patient, who was lost to follow-up, the lesion was not confirmed but was suggestive of a malignant process. Further doubts may be raised in the diagnosis of a malignant lesion based on colour variations at the lesion border or within the lesion itself. For instance, Manci et al. (2022) noted that hypopigmented borders were common among black patients with acral melanomas or SCCs, while BCCs tend to have accentuated pigmentation at the border of the lesion and healthy skin. However, this finding is not consistent across studies and skin types (Ezenwa et al., 2021; Ankad et al., 2023). Some of the features of common malignant lesions were seen in the case studies presented in this paper. For instance, erosions are often seen as characteristics of dermoscopy findings in patients with BCC (Ankad et al., 2023).

Dermoscopic features of BCC in people with SOC include a range of characteristic findings that strongly support diagnosis (Ankad et al., 2023). For instance, the presence of arborising telangiectasia, ulceration, grey-blue globules and spoke-wheel formations are largely linked to certainty in the diagnosis (Ankad et al., 2023). In people with darker skin, darker pigmentation can be commonly seen in BCC and can resemble a seborrheic keratosis or melanoma (Manci et al., 2022).In contrast, SCC in people with SOC is denoted by brown colouration in the peripheral aspect of the lesion on dermoscopy, with pronounced asymmetry, structureless patterns and dots, and the potential for blue or grey linear arrangement and coiled blood vessels within the lesion (Ezenwa et al., 2021). Many non-specific features may also be evident, even in more advanced disease, including regular borders, amorphous patterning, variegated colours and pigmentary networks, necessitating a high level of suspicion in lesions on the lower regions and particularly intertriginous regions (Ezenwa et al., 2021). Acral melanoma (acral lentiginous melanoma) is often characterised by a parallel ridge pattern and a blue-white veil, with or without non-site-specific features of melanoma (Ankad et al., 2023). Lesions that may be particularly concerning include those with a large diameter (>7mm) and with atypical features, highly suggestive of malignancy (Ezenwa et al., 2021).

Other lesions seen in the included case studies showed some characteristics features on examination and dermoscopy that may assist with diagnosis. For instance, cases

demonstrating gyri and milia-like cysts in lesions were largely consistent with a diagnosis of seborrheic keratosis (Hocker et al., 2022; Enchukwu et al., 2023). Similarly, cases of benign nevi were largely consistent with characteristics and features seen across skin colour types (Clarke, 2019). Importantly, some case studies pairs highlight complexity in differentiating one lesion type from another, including lesions affecting the lips and nails. For instance, two case studies included irregular lip pigmentation, with one diagnosis of Peutz-Jeghers syndrome or attributed to normal racial lip colouration. The other was intended to be investigated by biopsy, but parents of the affected child preferred to avoid this approach, and a watch-and-wait strategy was implemented. Peutz-Jeghers syndrome is a systemic condition, and the presentation of polyps in the gastrointestinal tract and melanocytic macules of the mouth and lips are characteristic (McGurk and Vig, 2021). However, lip lesions are uniform and may be mistaken for normal pigmentation variations in some patients, necessitating the integration of wider systems approaches to support a diagnosis (e.g., gastrointestinal history) (Zahid et al., 2022). Watch-and-wait strategies may be appropriate where lesions are suspected to be benign or where further investigations are likely to cause cosmetic harm or are not wanted by the patient (Enchukwu et al., 2023). However, routine surveillance is important, especially on regions such as the mouth and lips, to avoid complex treatment options for lesions further down the line (Hocker et al., 2022).

Similarly, nail bed abnormalities have been associated with a number of different acute and chronic conditions, as well as pigmentation variations that are benign (Gupta et al., 2016). Importantly, the nail bed may be a more common area for malignant lesions, including melanoma, to appear in people with SOC, compared with those without SOC (Gupta et al., 2016; Madankumar et al., 2016). Multiple factors may influence diagnosis of nail bed lesions and the likelihood of malignancy. Primarily, age was a key factor in the reported cases, with a melanocytic lesion most likely in younger patients and melanoma *in situ* seen in an older patient (Jicman et al., 2023). Hutchinson's sign (periungual extension of brown or black pigmentation from the nail bed and matrix) was also positive in one case and may be a discriminatory sign for a melanoma *in situ* diagnosis (Robinson, 2024). Signs of malignancy considered reliable in people with SOC include brown-black colouration of lesions, Hutchinson's signs (or micro-Hutchinson's sign), globules of brown-black colour, band width more than two-thirds of the nail plate, and dystrophy of the nail plate (Longo et al., 2023). However, Longo et al. (2023) reported that onychoscopy, or nail plate dermoscopy, is limited for use in children and cannot be used to reliably diagnose amelanocytic melanoma, which accounts for around 25% of all nail melanomas in people with SOC (Longo et al., 2023). Nail pigmentation changes may be a normal part of ageing or reflective of ethnicity in many people presenting with pigmentation changes, with melanocytic activation leading to the generation

of pigmented lines from the nail matrix (Longo et al., 2023). In many instances, visual assessment of the nail bed alone is inadequate to identify signs of melanoma or malignancy unless combined with a range of specific features. For instance, the presence of nail disfigurement in association with pigment changes is indicative of melanoma of the nail bed (Ezenwa et al., 2021). Size and colour of the lesion on dermoscopy are among the most reliable predictors of melanoma differentiation, although often at later stages of melanoma presentation (Skudalski et al., 2025). A high level of suspicion is justified for pigmentary changes of the nail bed and pigmentary lines, a many may be signs of early melanoma and should be observed or managed appropriately (Ezenwa et al., 2021).

In summary, the case studies highlight not only diversity in lesions presenting in people with SOC but also the importance of accurate and swift testing, investigation, and diagnosis to promote optimal outcomes. Further discussion of the importance of these findings, as well as the wider literature review findings, are presented in the following chapter.

Discussion

The main findings of this review reflected the three main themes to emerge from the 20 identified studies. Specifically, the literature suggests that barriers to skin cancer detection and diagnosis in people with SOC include underestimation of risk, lack of awareness, and lack of knowledge. This review uniquely provides insights into the specific factors that may serve as barriers to early detection and diagnosis of skin cancer in people with SOC, while highlighting the potential for interventions and strategies to improve care. Furthermore, the included case studies highlight the challenges in identifying skin lesions consistently based on appearance alone, suggesting the need for a detailed history, examination and further investigations in some patients to confirm a diagnosis of reassure the patient.

Comparison of the findings of this review with the wider literature suggests that the main findings align with what is broadly known about skin cancer risk and challenges in people with SOC. For instance, it has been noted in reviews of the literature that there is evidence supporting a link between skin cancer risk and people with SOC, but also that there are disparities in outcomes that may be due to lack of awareness, poor detection, and delays in treatment (Davis et al., 2021; Lopes et al., 2021). However, to date there is no clear evaluation of the literature focused on barriers to detection and diagnosis in this population. Research has supported the idea that people with SOC (Fitzpatrick types IV-VI) may have a false sense of security regarding their risk of cancer and the need for sun protection, but a robust evaluation of studies is not evident in the published literature (Goon et al., 2021). Hence, the present review adds value to previous studies and knowledge on this topic through a focused synthesis of data.

One of the key findings of this review is that awareness and knowledge of skin cancer risk and of the need for sun protection may be low in populations with SOC. Awareness and knowledge on this topic may reflect not only a lack of targeted education from healthcare staff, but also poor awareness within social, family, or cultural groups (Naik and Farrukh, 2022). This is evident where cultural factors and assumptions not only serve to influence estimations of risk for cancer but also influence UV- protecting behaviours (Agbai et al., 2014; Gupta et al., 2016). Equally, it can be suggested that this group may lack support from formal care services and wider media with regards to their risk of skin cancer, reflecting an overall paucity of opportunities for health awareness (Krutmann et al., 2023).

There is a general lack of support and information for this group, as evidenced by the findings of a recent study noting that SOC representation in skin cancer information is limited using Internet search strategies (Jean-Pierre and Nouri, 2024). Not only is there a need for more information and representation to enhance awareness and inform people with SOC, but there is a need for quality, tailored information that can meet the needs of these groups (Tod et al., 2024). Indeed, tailored information should address misconceptions, specific symptoms and signs, and wider factors that may serve as barriers to detection and help-seeking for suspected cancerous skin lesions (Tsai and Chien, 2023).

It is important to note that awareness and knowledge are not completely associated with changes in behaviour, as many factors may influence the link between intentions and health actions (Starfelt Sutton and White, 2016). One key moderator of intentions to act on information is the perception of individual risk, which, as noted in this review, may be low among people with SOC (Jacobsen et al., 2017; Sanchez et al., 2020). Other factors may also influence behaviours, where intentions may be obstructed by familial or social pressures, misinformation, and lack of services (Dillard et al., 2018). Furthermore, when presenting to health services, a lack of effective or accurate assessment may result in missed opportunities for diagnosis (Usher-Smith et al., 2018). Indeed, data suggest that patients with SOC presenting to dermatologists may experience delays and inaccuracies in diagnosis, suggesting that presentation to services alone is not an adequate marker for care improvement and quality outcomes (Karampinis et al., 2023). Therefore, it is important to reduce barriers to positive health behaviours and to promote quality in care to ensure outcomes can be optimised.

The recent publication of consensus guidelines on dermoscopy criteria for skin tumour diagnosis (Ankad et al., 2023) highlights the importance of assessments in people with different skin types and how features of diagnosis and detection of cancer may in this group compared with white groups. There is a need for such guidance to be aligned with training and education for physicians and other healthcare professionals to ensure that people with SOC can be diagnosed accurately when presenting to services (Ankad et al., 2023). To support the use of these guidelines, there is a need for increased research on skin diagnoses in people with SOC, as it has been shown that under-representation may limit learning opportunities (Fahmy et al., 2023). Furthermore, people with SOC may lack opportunities to use important diagnostic adjuncts, such as dermoscopy, as research suggests that this may not be broadly used or available in many regions, particularly with low socioeconomic status (Enechukwu et al., 2024). It is important that guidelines are not only considered in local setting and in high-income contexts, but that they can provide opportunities for other regions (White et al., 2019).

Hence, further assessment is needed to support diagnoses of skin cancers in people with SOC across global regions (Kuo et al., 2021).

Implications of the review findings are numerous and include the importance of recognising how risk perceptions, awareness, knowledge and cultural beliefs/perceptions may be inter-related and form potential barriers and facilitators to positive behaviours. These implications are considered further in the conclusion section but illustrate the importance of raising awareness and promoting knowledge on skin cancer among people with SOC, which has been noted in wider literature (Niu et al., 2024). Co-design and participatory methods may be of importance in ensuring that new strategies and interventions meet the needs of the target population (Blumenthal et al., 2022; Finster et al., 2022). In addition, the review findings imply that the issue is not only in raising awareness and changing behaviours among people with SOC, but that improvement in health services is also needed (Taylor, 2023). This includes enhancement in the quality of information provided to the population, how information is targeted, outreach strategies, and skills of practitioners in diagnosing and managing cancer in people with SOC (Ahmed et al., 2023; Francis, 2023). For instance, strategies to improve medical knowledge of ethnic issues in dermatology have been trialled in the United Kingdom (Jagun et al., 2022) and may have positive short-term effects on raising awareness and increasing confidence in diagnosing conditions in people with SOC. However, broader changes in student education and in comprehensive training on this issue remain to be seen across nations.

This review has some limitations which should be considered prior to concluding the paper and formulating potential recommendations for future research and practice (Polit and Beck, 2020). Firstly, the review was completed by a single author, which may have increased the potential for bias in the selection and analysis of the literature (Moule et al., 2016). Strategies to minimise bias included transparency in the review process and adoption of clear frameworks in the methodology, such as the search strategy details and the PRISMA statement. There was also a relative paucity of literature on the topic of skin cancer diagnosis and outcomes in people with SOC, with few studies providing insights into the potential for improving outcomes in this group. While there was sufficient data to provide thematic analysis and conclusions on many aspects of the scope of this review, limited data on some areas may reduce the overall reliability of the findings (Ellis, 2022). This is further complicated by the heterogeneity in the studies, based on different designs, populations, outcomes assessed, and definitions used, which may preclude simple comparison and direct comparison of interventions (Tappen, 2022). Finally, there was heterogeneity in the target population, as people with SOC may include a wide range of ethnicities, which may limit

generalisability/transferability of findings on cultural elements linked to skin cancer diagnosis across this whole group (Shao and Feng, 2022). Further studies exploring culture- or ethnicity-specific challenges and barriers linked to skin cancer diagnosis and outcomes may be of value in providing more nuance to data on this group.

Conclusion

This review sought to evaluate the methods that may be used to improve recognition and early identification of skin cancer in people with SOC. The focused literature search led to identification of 20 unique studies which revealed three main themes linked to challenges and opportunities for improving skin cancer diagnosis in people with SOC. These themes provided specific insights into the answers of the three review questions, (1) focusing on barriers to detection/diagnosis of skin cancer, (2) the influence of cultural beliefs and perceptions, and (3) the interventions and strategies that may be used to improve care in people with SOC.

The current barriers to early recognition and timely diagnosis of skin cancer in individuals with SOC include lack of perceived risk of skin cancer, lack of awareness of the condition and lack of knowledge related to skin cancer among people with SOC. Cultural beliefs and perceptions about skin cancer impact the willingness of individuals with SOC to seek medical attention, which highlight the importance of targeting not only individual-level knowledge but also wider knowledge and in engaging communities/families to expand awareness of these issues. Furthermore, strategies to enhance access to services and information provision to encourage service use, such as dermatologist/physician consultation, are needed to facilitate changes in outcomes linked to changes in awareness, knowledge and behaviours.

Some of the interventions or strategies can be implemented to improve awareness, early detection, and outcomes of skin cancer in SOC populations, including information provision to increase knowledge and awareness and specific outreach strategies to encourage more vulnerable groups to attend health services (Marchetti et al., 2021). These strategies show some potential in improving outcomes in people with SOC, although evaluations are often limited to small populations, homogeneous populations, and over a short-term period. The findings to date support the need for tailored interventions aimed at people with SOC but there is a need to build on these interventions to realise their full potential (Jacobsen et al., 2021).

Despite the value of the findings of this review, it is appreciated that more needs to be done to enhance knowledge and improve practice in this area. From a research perspective, there is a need for more data from ethnically diverse populations, with skin types IV–VI to inform an understanding of the attitudes, beliefs, and behaviours that link skin tone/colour to perceptions of skin cancer risk and treatment. Specifically, qualitative insights into the detection and diagnosis of skin cancer will be important to understand how factors can be targeted to promote awareness and knowledge in these areas. Furthermore, there is a clear need for

more robust evaluations of the impact of targeted interventions, including information campaigns and education, in improving skin cancer detection, diagnosis and treatment. This should include evaluations of presentation to health services and experiences of patients within services. Finally, more data are needed on the perspectives of healthcare professionals, including information needs, confidence, and other factors that may influence diagnosis of skin cancer in people with SOC.

Finally, the practice implications of these findings should be considered primarily from two perspectives that emerged from the literature: the need to enhance awareness and knowledge of skin cancer risk among people with SOC and the need to improve diagnosis and detection of skin cancer in this population though enhanced healthcare professional training and education. Enhancing awareness and knowledge of skin cancer risk, sun protection benefits and other positive behaviours among people with SOC should include tailored strategies that are specific to the signs and symptoms of skin cancer in SOC, as well as being culturally appropriate and accessible. Broad strategies should be used to target groups at individual, group and community levels, using a variety of media to maximise the potential benefit of these approaches. Furthermore, education strategies and training for healthcare professionals and students should be developed and implemented to support positive changes in detection and diagnosis of skin cancers, as well as in providing individualised education to those affected or at-risk. Hence, there is an important burden on both patients and providers to challenge inequities in skin cancer care among people with SOC.

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