CLINICAL AND DERMOSCOPIC FEATURES OF ACRAL MELANOCYTIC NEVI IN AFRICAN PATIENTS, PIETERSBURG HOSPITAL

by

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MINI-DISSERTATION

Submitted in partial fulfilment of the requirements for the degree of

MASTER OF MEDICINE

in

DERMATOLOGY

in the

FACULTY OF HEALTH SCIENCES

(School of Medicine)

at the

UNIVERSITY OF LIMPOPO

SUPERVISOR: Dr AR Sema-Ramashala

2025

DEDICATION

To my wife, Mrs Hanna Shantel Molapo, and my children Ramolapo, Thato, Olesego and Atlehang; thank you for the support and for your patience during my studies. You have been my strength and compass throughout.

To my mother Magdeline Mohola “Mohwelasagwe” Molapo’’, you were always my first teacher and because of you I came to believe that I can shape the destiny of my life. Thank you for showing me that a person’s circumstances are nothing compared to their dreams, you have always been my greatest living inspiration.

DECLARATION

I declare that “Clinical and dermoscopic features of acral melanocytic nevi in African patients, Pietersburg Hospital”, is my own work and that all the sources that I have used or quoted have been duly acknowledged and indicated under the complete list of references section. I further declare that this work has not been submitted by anyone in any institution before for any other degree.

Dr Ramolapo Antony Molapo

Signature:  Date: 30 May 2024.

ACKNOWLEDGEMENTS

I would like to thank my supervisor Dr AR Sema-Ramashala, for her mentorship, guidance and patience during all phases of this research project. To my fellow registrar and colleagues in the Department of Dermatology at Pietersburg Hospital, thank you for all your encouragement, motivation and support. To my statisticians, Mr Peter Mphekgwana and Dr Sam Ntuli, thank you for your assistance during the protocol phase and the final write up of this mini-dissertation.

ABSTRACT

Background: Acral melanocytic nevi (AMN) of volar skin are common in Asians, Africans, Caucasians and Indians. Some cutaneous melanomas arise from AMN, and it is difficult to determine which nevus will become malignant clinically. Dermoscopic evaluation of nevi has been used to describe various patterns, some of which have been found to be associated with melanoma. Most of these studies were conducted in Caucasians and hence a paucity of literature in Africans.

Objective: To describe the clinical and dermoscopic features of acral melanocytic nevi in African patients at Pietersburg Hospital.

Methodology: A quantitative, cross-sectional method was used in the study. A total of 269 adult African patients with AMN were examined. The findings were recorded photographically, and descriptive statistics were used to organise the data. The Chi-squared test was used to test for associations.

Results: A total of 269 patients were enrolled. The age ranged between 18 and 87 years and the mean was 37.1 years. Females were 67%, and males 33%. Majority (99.26%) AMN were macules, more commonly observed on the right palm (54.6%). Commonest colours were brown (84.4%) and black (14.9%). Dermoscopically, the commonest patterns were: parallel furrow pattern (59.9%), globular pattern (10.0%), fibrillar pattern (9.7%) and homogeneous pattern (8.6%). The fibrillar pattern was found to be higher in females (p=0.016), than in males.

Conclusion: The parallel furrow pattern was most prevalent, followed by the globular and homogeneous patterns in the study. A rare arciform clinical morphology was reported in two AMN (0.74%).

Key Concepts: Acral melanocytic nevi, African patients, clinical features, dermoscopic patterns, volar skin,

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

DEFINITION OF CONCEPTS

Acral: The distal portions of the limbs, including the volar surfaces of the hands and feet (Thomas, Phang, Pralong, Poulalhon, Debarbieux et al., 2013).

In this study, acral refers to the palms of the hands and the soles of the feet.

Acral melanocytic nevus: (Also known as a “mole” or “birthmark”). Pigmented skin lesions arising from melanocytes that can be congenital or acquired. They are benign but may become cancerous (Russak and Dinulos, 2006), occurring on the distal portions of the limbs, including the volar surfaces of the hands and feet (Thomas, Phang, Pralong, Poulalhon, Debarbieux et al., 2013).

In this study, acral melanocytic nevi means acquired well-defined pigmented lesions occurring on the palms and soles, which are of melanocytic origin.

African: A native or inhabitant of Africa, a person and especially a black person of African ancestry (Merriam-Webster)

In this study is means dark skinned, South African individuals who identify as black.

Clinical: Pertaining to a clinic or the bedside; pertaining to or founded on actual observation and treatment of patients, as distinguished from theoretical or experimental (Pickrell, 2003).

In this study, it means information regarding nevi that will be obtained from the patient, in a hospital setting, through history taking and objective physical observation/examination of an actual consenting patient.

Dermoscope: A dermoscope is a handheld device that can magnify skin lesions up to a hundredfold, enabling the identification of subtle clinical patterns not normally visible to the naked eye (Soyer, Argenziano, Chimenti and Ruocco, 2001).

Dermoscopic characteristics: Morphologic skin patterns or structures that are not visible by naked eye examination of the skin, but can be detected when using a magnifying handheld device called a dermoscope or dermatoscope (Soyer, Argenziano, Chimenti et al., 2001).

In this study, this means lesional skin patterns that will be reported on by the clinician, when using a dermoscope to examine the nevi of consenting patients.

Features: Prominent or distinctive parts, quality, or characteristics, outward appearance; form or shape (Pickrell, 2003).

In this study it means characteristics of nevi as reported by patients, and the observed physical characteristics such as size, site, shape, colour, borders and number of nevi.

Melanocyte: Melanocytes are neural-crest–derived cells that are located in the dermo-epidermal junction of the epidermis, in the uvea and within hair follicles, are responsible for the colour (melanin) of the skin, eyes and hair and the protection of keratinocytes from ultraviolet (UV) radiation via the production and transfer of melanin (Lin and Fisher, 2007).

In this study, melanocytes mean pigment-producing cells as defined above, which are responsible for the appearance of nevi on the palms and soles.

Melanocytic nevi: Benign neoplasms composed of melanocytes. They are classified as either acquired or congenital and further subdivided into common acquired nevi, rare nevi, blue nevus, Spitz nevus (and its variants), atypical melanocytic nevus and “nevi of special sites”, (which includes nevi occurring on genital, flexural and acral skin) (Hauschild, Egberts, Garbe, Bauer, Grabbe et al., 2011).

In this study, this means benign palmar and plantar lesions that contain melanin pigment.

LIST OF ABBREVIATIONS

AM	Acral Melanoma
AMN	Acral Melanocytic Nevus/nevi
DoH	Department of Health
FP	Fibrillar Pattern
GP	Globular Pattern
GSL	Globulo-Streak Pattern
HREC	Pietersburg/ Mankweng Hospital Research Ethics Committee
HP	Homogenous Pattern
LDoH	Limpopo Department of Health
LLP	Lattice-Like Pattern
MCP	Mixed Component Pattern
NTP	Non-typical Pattern
PFP	Parallel Furrow Pattern
PRP	Parallel Ridge Pattern
RP	Reticular Pattern
SA	South Africa
TP	Transition Pattern
TREC	Turfloop Research Ethics Committee
USA	United States of America

CHAPTER ONE

INTRODUCTION AND BACKGROUND

1.1 INTRODUCTION

Acral melanocytic nevi (AMN) are benign neoplasms composed of melanocytes, occurring on acral sites (palms and soles). Acral melanoma (AM) is a malignant neoplasm and also occurs on the palms, soles and nails. Accurate differentiation between AMN and AM is critical as correct and timely diagnosis of AM can save lives. The two neoplasms may resemble one another and have subtle differences that can be missed by an untrained eye. Carefully clinical evaluation of the shape, size, colour and the presence of any secondary changes on the neoplasm aid in differentiation between the two. Clinically AM has a larger diameter, tends to have an asymmetrical shape with ill-defined borders, may have more than one colour and may be ulcerated. Diagnosis of AM previously relied on clinical and histopathological findings. The advent of dermoscopy has since improved the diagnostic accuracy of AM (Criscito and Stein, 2017).

The clinical and dermoscopic features of AMN have to date largely been studied and reported in American, European and Asian countries (Gill, Wang, Mancebo, Lim and Kohen, 2015; Madankumar, Gumaste, Martires, Schaffer, Choudhary et al., 2016). Studies in black populations are severely limited, and the researcher has not come upon studies in South African populations.

AMN are common, with a prevalence of 28 to 36% in the United States of America (USA) and they are more common in black patients compared to white patients (Palicka and Rhodes, 2010; Madankumar et al., 2016). African prevalence rates are severely lacking, but in 1968 Lewis and Johnson reported a prevalence of 92.3% in a population of 390 Ugandan patients.

Acral melanoma accounts for 60% to 75% of all cutaneous melanomas in black populations worldwide (Palicka and Rhodes, 2010). In South Africa, 80% of cutaneous melanomas diagnosed in Africans are on acral sites (De Wet, Tod, Visser, Jordaan and Schneider, 2018). Many African patients are diagnosed at a late stage and present with advanced disease. The mortality rate from AM is high in black patients, with a reported 5-year survival rate of less than 25% (Hudson and Krige, 1993).

This study was a prospective cross-sectional study that described the clinical and dermoscopic features of AMN in dark-skinned individuals. The rationale is based on the paucity of data on AMN in African black patients, high prevalence rates of AMN in black patients in non-African countries and the late diagnosis and poor clinical outcomes of AM in black patients. This study aims to report on the clinical and dermoscopic features of AMN in black South Africans.

1.2 RESEARCH PROBLEM

The researcher is a registrar in dermatology at Pietersburg Hospital, and has noted a high proportion of patients with pigmented lesions on their palms and/or soles during routine patient consultations. The majority of patients being treated in this department are black, and it is believed that AMN occur with greater frequency in black patients compared to other population groups. An estimated 27% of AM arise from AMN, which makes these nevi an important risk factor for melanoma. The prevalence, clinical and dermoscopic features of AMN have predominantly been described in European, American and Asian populations. The researcher has further noticed the paucity of published literature on the clinical and dermoscopic features of AMN in African, and particularly, South African black patients. Due to paucity of data on AMN in African black patients, high prevalence rates of AMN in black patients and the late diagnosis and poor clinical outcomes of AM in black patients, the researcher felt compelled to undertake this study.

1.3 PURPOSE OF THE STUDY

1.3.1 Aim of the study

The aim of the study is to describe the clinical and dermoscopic features of acral melanocytic nevi in African patients at Pietersburg Hospital.

1.3.2. Objectives of the study

The objectives of the study are:

To describe the clinical features of acral melanocytic nevi in African patients at Pietersburg Hospital.

To describe the dermoscopic features of acral melanocytic nevi in African patients at Pietersburg Hospital.

To determine the associations between the clinical and dermoscopic features of acral melanocytic nevi and demographics such as age and gender.

1.4 RESEARCH QUESTIONS

The research questions are aligned with the research objectives as follows:

What are the clinical features of acral melanocytic nevi in African patients at Pietersburg Hospital?

What are the dermoscopic features of acral melanocytic nevi in African patients at Pietersburg Hospital?

What are the associations between the clinical and dermoscopic features of acral melanocytic nevi and demographics such as age and gender, in African patients at Pietersburg hospital?

1.5 RESEARCH METHODOLOGY

1.5.1 Research design

This was a quantitative cross-sectional study. Data was collected prospectively from patients to determine the clinical and dermoscopic features of acral melanocytic nevi.

1.5.2 Sampling

We used a consecutive sampling method. The Krejcie and Morgan sample table was used to determine a sample size of 269 patients.

1.5.3 Data collection

The study participants were identified during their routine dermatology clinic visit. Consenting participants were first clinically examined, then examined with a dermoscope. Images of the physical and dermoscopic examinations were taken.

Clinical images of AMN were photographed with a Canon EOS 2000D camera, dermoscopic examination was with a “DermLite Foto II Pro - 3Gen” dermoscope. Dermoscopic images were photographed using a Nikon D500 camera. Data was collected using a data collection sheet adapted from a prior similar study (Annexure 2)

1.5.4 Data analysis

Data was captured on an excel spreadsheet and analysed on SPSS version 26. Descriptive statistics were used to organise and summarise the data. Categorical variables were expressed as frequencies and percentages. Continuous variables were expressed as the mean and standard deviations. The Chi-squared test was used to analyse the associations between acral melanocytic nevi and demographics such as age and gender.

1.5.5 Reliability, Validity and Objectivity

To ensure validity and reliability of results, the data collection tool was adapted from an instrument that was used by Palicka and Rhodes (2010). The Krejcie and Morgan sample table (1970) was used to determine a representative sample size with adequate statistical power, and the variables measured in the clinical and dermoscopic examinations are very well defined and standardised in the medical and dermatology literature.

1.5.6 Bias

Selection bias was minimised by selecting a large representative study population, and through using the consecutive sampling method. Researcher bias was reduced through taking photos of all lesions described and reviewing them with the supervisor or other colleagues.

1.6 ETHICAL CONSIDERATIONS

1.6.1 Permission to conduct the study

Ethical clearance certificates were obtained from Turfloop Research Ethics Committee (TREC), the Limpopo Department of Health and from Pietersburg/ Mankweng Hospital Research Ethics Committee (PMREC) prior to commencing with the research.

1.6.2 Informed consent

Informed consent is the permission that is granted by an individual or someone acting on behalf of another individual for a procedure or process to be carried out on their person in medicine or research (DeRenzo, Singer and Moss, 2020). It is granted after full disclosure about the procedure or process is given to the individual, and it should be clear that the individual can grant or refuse permission and no adverse consequences will follow refusal. Written Informed consent was obtained from all consenting participants. Informed consent forms were written in English, Xitsonga, Sepedi and Tshivenda. Participants were permitted to withdraw from the study at any point, and patients who did not want to participate in the study were not coerced to participate.

1.6.3 Anonymity

Numbered codes were produced and allocated to each patient for anonymity. All clinical and dermoscopic images do not have the patients' face or any other identifiable features.

1.6.4 Privacy and confidentiality

Examination of participants was in a private consultation room and the raw data was handled by the researcher only.

1.6.5 Benefits and risks

1.6.5.1 Beneficence

Beneficence is an ethical principle that puts an obligation on researchers to perform research that will benefit research participants and society at large (DeRenzo, Singer

and Moss, 2020). Patients who were identified through this research to have suspicious lesions, were referred to the clinic for further evaluation and treatment. The findings of the study will add to the body of knowledge in the field of dermatology and across disciplines.

1.6.5.2 Non-maleficence

Non-maleficence is the ethical principle that dictates that no harm should come to a patient as a result of their participation in a research project (DeRenzo, Singer and Moss, 2020). The researcher is a qualified medical doctor and has adequate training and is fully competent to perform a clinical and dermoscopic examination. Data collection occurred during patients' normal dermatology consultation appointment, and so no additional financial burden was incurred by the participants.

1.7 SIGNIFICANCE OF THE STUDY

The significance of this study is that it will add to clinicians' medical knowledge regarding the clinical and dermoscopic features of AMN in South African patients. During the literature research, the researcher found a paucity of published reports on this condition in an African setting, although other countries have studied this condition in their setting/population. The combination of clinical and dermoscopic features improves the diagnostic accuracy for AMN and AM. This study can identify suspicious features of AMN and diagnose AM earlier leading to earlier treatment of AM and better treatment outcomes.

1.8 OUTLINE OF THE STUDY

The structure of the study is as follows:

In chapter one, the researcher introduces the study and states the research problem. The purpose of the study, research questions, research methodology and ethical considerations are discussed. Chapter one then concludes with the significance of the research.

Chapter two is a detailed literature review on published studies on AMN.

Chapter three covers the research methods used, including the research design, sampling, data collection, data analysis and validity of the study.

Chapter four discusses the process of data management and analysis and provides an overview and analysis of the research findings.

Chapter five provides the recommendations and conclusions of the study, in relation to the research questions and the problem statement.

1.9 CONCLUSION

This chapter provided a brief overview of the study. The chapter introduced the background and research problem. A summary of the literature review was presented and the research aim and objectives were discussed. The research design, ethical principles followed and significance of the study were also briefly discussed. A comprehensive literature review will be presented in chapter 2.

CHAPTER TWO

LITERATURE REVIEW

2.1 INTRODUCTION

This section entails a review of the prevalence, clinical features, dermoscopic features and relationships with acral melanoma. Google scholar, PubMed and Clinical Key were the primary databases searched. The chapter is organised into the following headings:

Prevalence of acral melanocytic nevi and acral melanoma
Clinical features of acral melanocytic nevi and acral melanoma
Dermoscopy/Dermoscopic examination
Dermoscopic features of acral melanocytic nevi and acral melanoma
Associations between AMN and demographics
Management of acral melanocytic nevi

2.2 PREVALENCE OF ACRAL MELANOCYTIC NEVI AND ACRAL MELANOMA

2.2.1 Prevalence of acral melanocytic nevi

In the United States of America (USA), the prevalence of AMN was reported to be between 28% (Palicka and Rhodes, 2010) and 36% (Madankumar, Gumaste, Martires, et al., 2016), where they are more common in black populations. AMN are present in 4 to 9% of the British population (MacKie et al., 1985), 6.8% in Mexico (González-Ramírez et al., 2018), and 8% to 10.9% of the Japanese population (Saida et al., 2002). To the best of the researcher's knowledge, in Africa, no published studies are available on clinical and dermoscopic features of AMN.

2.2.2 Prevalence of acral melanoma

Melanoma is the deadliest form of skin cancer that arises from melanocytes. Acral melanoma is melanoma occurring on the distal parts of the limbs, including palms, soles, and nails. It is the least common type of melanoma among Caucasians, accounting for about 2–3% of cases in the white population of the USA. However, it accounts for up to 60–70% of melanomas in dark-skinned individuals (Qian, Johannet, Sawyers, Yu, Osman et al., 2021). In South Africa, 80% of cutaneous melanomas diagnosed in blacks are on acral sites (De Wet, Tod, Visser, Jordaan and Schneider, 2018).

2.3 CLINICAL FEATURES OF ACRAL MELANOCYTIC NEVI

Acral skin is defined as the skin of the volar hands, and the skin of the foot distal to the line of Wallace (Thomas et al., 2013). Clinical variables used to describe all nevi are anatomic location, morphology or shape, borders, colour and diameter. The acronym ABCD is commonly used to describe the clinical features. This acronym applies to both benign acral melanocytic nevi and malignant acral melanoma. AMN classically have a regular, symmetric round or oval shape, well defined borders, one colour and a diameter < 7mm (Criscito and Stein, 2017).

Additional important clinical features are the anatomic location, the morphology or gross appearance of the nevus (macule, papule, nodule, and tumour) and any other changes in the skin (ulcerated, eroded or with scale visible). All these clinical features are grouped and interpreted as benign or as suspicious (Criscito and Stein, 2017).

2.3.1 Anatomical location

Most studies demonstrate that AMN are more common on the palms than the soles (Table 2.1) of patients (Palicka and Rhodes, 2010; Gill et al., 2015; Serrano, Jerdan, Choudhry and Hernandez, 2015; Madankumar et al., 2016; González-Ramírez et al., 2018). Ozdemir reported in a 2007 study of 138 Turkish patients a distribution of 52.66% AMN occurring on the palms versus 47.34% on the soles (Ozdemir et al., 2007). Similarly, a study by González-Ramírez et al., (2018) found the distribution patterns of AMN to be 83.5% (palms) and 16.5% (soles). However, two studies reported a higher frequency of nevi on the soles. A study of 641 Italian patients by Altamura, Altobelli, Micantonio, Piccolo and Fargoli, (2006) found a distribution pattern of 70.5% (soles) and 9.3% (palms), with 20.2% on the volar or lateral aspect of the fingers. Barquet, Dufrechou, Nicoletti, Acosta and Magliano et al., (2013) found a distribution of 58.7% (soles) and 51.3% (palms). On the palms, the majority of nevi are located on the palmar aspect of the digits, the thenar eminence, the centre of the palm, and the hypothenar eminence. On the soles, nevi are predominantly located on the arch, volar aspect of the toes and the heels (Barquet et al., 2013).

Table 2.1 Summary of reported findings of anatomical distribution of AMN

Author	Year	Setting	#	Soles	Palms
Ozdemir et al.,	2007	Turkey	138	47.34%	52.66%
Barquet et al.,	2013	Uruguay	80	48.7%	51.3%
Serrano et al.,	2015	Chicago	106	38.7%	61.3%
Madankumar et al.,	2016	New York	1052	41.6%	58.4%
González-Ramírez et al.,	2018	Mexico	321	16.5%	83.5%

2.3.2 Morphology

AMN are described as round or oval, with a symmetric shape. They are usually flat, but 3% to 12% are raised (Allyn, Kopf, Kahn and Witten, 1963). Features like ulceration and bleeding are associated with AM. Frances, Blanes, Leiva-Salinas and Bañuls (2015) reported a series of 9 patients with linear plantar nevi.

2.3.3 Borders

AMN typically have well-defined, regular borders. However, about 4% to 7.6% of AMN exhibit moderately ill-defined borders, and 1.3% to 4% exhibit some border irregularity (Palicka and Rhodes, 2010). Ill-defined, irregular borders are suspicious features, and taken together with other clinical findings, may be associated with AM.

2.3.4 Colour

The commonest described colour for AMN is brown to dark brown (Palicka and Rhodes, 2010; Gill et al., 2015); however, the colour can range from dark brown, black to blue or display colour variegation. In Turkey, Esener, Sarenur and Mevlitoğlu, (2019) reported dark and light brown as the commonest colours in a study of 97 patients. Dark and light brown were also reported by Ozdemir et al. (2007). Disaggregated by race, the commonest colour is light brown for white-skinned patients and very dark brown for black-skinned patients (Palicka and Rhodes, 2010).

2.3.5 Diameter

AMN are usually small (<7mm diameter), and a diameter of > 7mm is a suspicious feature associated with AM (Tucker, Halpern, Holly et al., 1997). Palicka and Rhodes, (2010) reported diameters of 0.5 to 3.0 mm for palmar nevi, and 0.8 to 7.0 mm for plantar nevi in white patients (Table 2.2). In African American patients, the diameter of palmar nevi ranged from 0.5 to 8.0 mm; and for plantar nevi, 1.0 to 10.0 mm.

Similarly, Gill et al., (2015) reported diameters of 2.2 mm to 7mm for palmar nevi, and 3mm to 13.5mm for plantar nevi in a cohort of 39 African American patients. These findings demonstrate that AMN in Blacks tend to be larger in diameter, whether this is risk factor for AM or not is unknown. It is also not known whether the 7 mm cut-off point for AMN versus AM should be applied to Blacks, as it is to Whites (Palicka and Rhodes, 2010).

Table 2.2 Summary of reported findings of minimum and maximum diameters of AMN

Author	Year	Soles	Palms
Palicka & Rhodes	2010	0.8 to 7.0 mm (W) 1.0 to 10.0 mm (AA)	0.5 to 3.0 mm (B) 0.5 to 8.0 mm (AA)
Gill et al.,	2015	3mm to 13.5mm (AA)	2.2 mm to 7mm (AA)

2.4 OTHER PIGMENTED ACRAL LESIONS

Not all pigmented skin lesions occurring on acral sites are melanocytic nevi. Talon noir/sub corneal hematoma, tinea nigra and exogenous acral pigmentation can mimic AMN (Choudhury and Mandal, 2023). Sub corneal hematoma is characterised by the presence of blood within the stratum corneum secondary to trauma, and occurs on acral sites, paring the affected skin with a scalpel blade allows the detachment of thin layers of pigmented skin (Savoia, F., Ravaioli, G.M., Tabanelli, M., Dika, E. and Patrizi, A., 2019) and can assist in differentiating from AMN.

Tinea nigra is a superficial mycosis commonly affecting palms and soles, it is caused by a melanised, yeast-like fungus and resembles AMN (Bonifaz, Badali, De Hoog, Cruz, Araiza . et al., 2008). It can be distinguished dermoscopically from AMN by the presence of grey or light brown spiculated pigmentation that does not follow the ridges or furrows (Nguyen¹, B. and Tosti, A., 2022).

2.5 CLINICAL FEATURES OF ACRAL MELANOMA

Clinical features that are deemed suspicious are shown in Figure 2.1 and include a diameter greater than 7 mm, variable pigmentation; irregular, asymmetric outline; and indistinct borders (Tucker, Halpern, Holly et al., 1997).

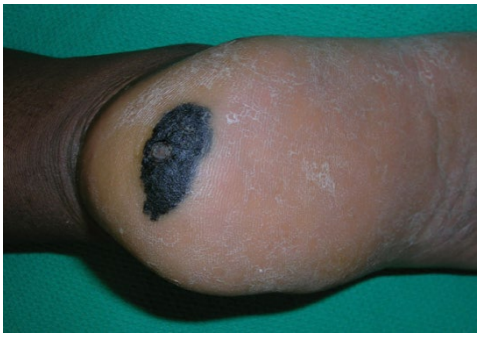


Figure 2.1: Acral lentiginous melanoma on the sole of the foot in a 30-year-old Black woman. (Usatine and Heath. 2022).

2.6 DERMOSCOPIC EXAMINATION

A dermoscope is a hand-held device (Figure 2.2) used in routine dermatological examination (Braun, Rabinovitz, Oliviero, Kopf and Saurat, 2005). It can be used on its own, or attached to a camera to capture a dermoscopic image during dermatological examination. Its use has significantly improved the diagnosis of melanocytic lesions in clinical practice (Braun, Rabinovitz, Oliviero, Kopf and Saurat, 2005).

Figure 2.2 “DermLite Foto II Pro-3Gen” dermoscope, with a Nikon D500 camera attached. (Dermlite, 2023)

Dermoscopic examination of the skin involves applying ultrasound gel or alcohol to the

skin, and then placing the glass plate of the dermoscope onto the skin to examine the skin under magnification ranging from 6x to 100x. Certain dermoscopic patterns are

associated with various dermatologic conditions (Soyer, Argenziano, Chimenti and Ruocco, 2001).

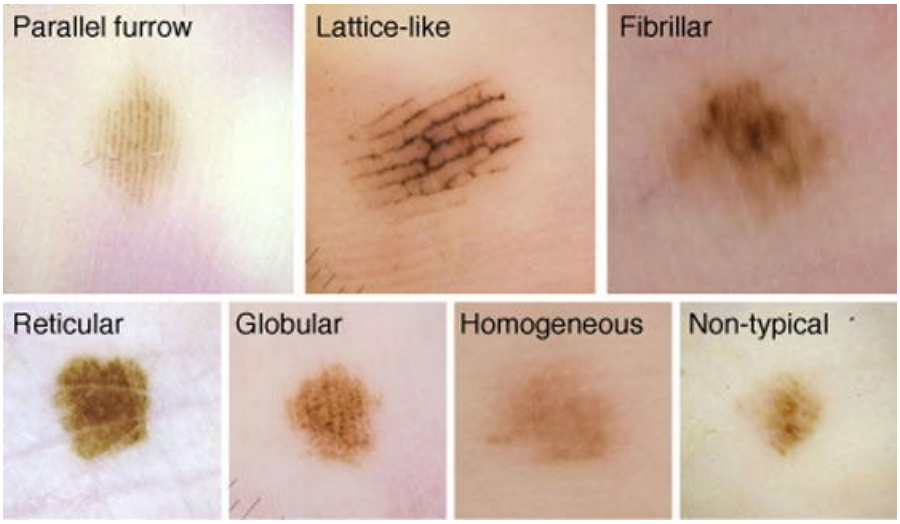
2.6.1 Dermoscopic features of acral melanocytic nevi

The parallel furrow, lattice-like, fibrillar, nontypical, reticular, globular, transition and homogeneous patterns are the most commonly reported patterns and are associated with benign AMN. More than 75% of AMN will exhibit one of three typical dermoscopic patterns: parallel furrow, lattice-like, and fibrillar pattern (Saida et al., 2002).

The parallel furrow pattern is characterised by pigmentation following the furrows on acral skin (Figure 2.3). With the lattice like pattern the pigmentation follows the furrows with linear bands of pigment crossing them. The fibrillar pattern has numerous, finely pigmented filaments perpendicular to the furrows and ridges and the homogenous pattern has a diffuse pigmentation (Criscito and Stein 2017).

Figure 2.3 Dermoscopic patterns of AMN

(Costello, Ghanavatian, Temkit, Buras, DiCaudo et al., 2018)



The dermoscopic features of AMN and AM have predominantly been described in European, Asian and Latin populations. Studies conducted in Barcelona, Italy, Turkey, Uruguay, Mexico, Chicago and New York show that the commonest patterns are parallel furrow, lattice-like, atypical and homogenous patterns (Malvehy and Puig,

2004, Altamura et al., 2006, Ozdemir et al., 2007, Barquet et al., 2013, González-Ramírez et al., 2018).

2.6.2 Dermoscopic features of acral melanoma

Suspicious dermoscopic patterns associated with AM, are parallel ridge pattern, irregular diffuse pigmentation, multicomponent and structureless patterns (Figure 2.4). The parallel ridge pattern is characterised by band-like pigmentation on the ridges of the skin. The sensitivity and specificity of the parallel ridge pattern in diagnosing early acral melanoma are said to be 86% and 99% (Saida et al., 2004).

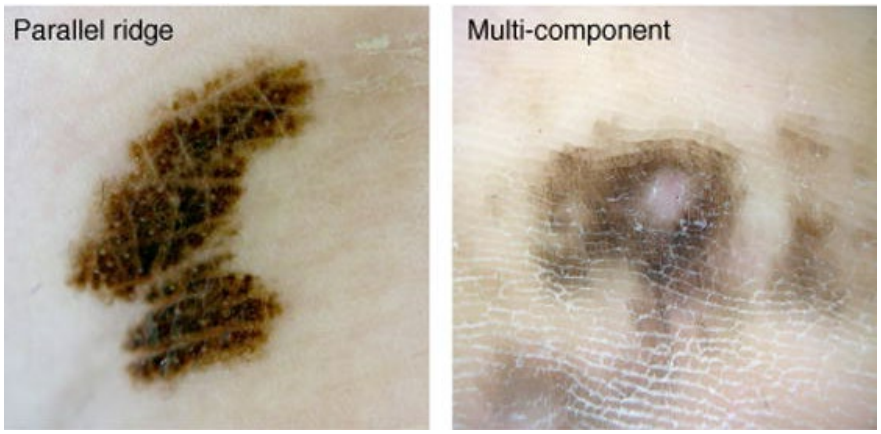


Figure 2.4 Dermoscopic patterns of acral melanoma

(Costello et al, 2018)

2.7 ASSOCIATIONS BETWEEN AMN AND DEMOGRAPHICS

Various studies have reported on the associations of AMN with race and gender (Palicka and Rhodes, 2010; Gill et al., 2015; Madankumar et al., 2016). Studies have reported on the differences in prevalence, diameter and colour of AMN in black and white populations and male versus female patients (Palicka and Rhodes, 2010; Gill et al., 2015; Madankumar et al., 2016).

AMN are more prevalent, larger in diameter and darker in colour in black-skinned patients versus their white-skinned counterparts. The prevalence rate of AMN in white women is significantly higher than in white men (Palicka and Rhodes, 2010; Mackie et

al., 1985). The prevalence rates of black women versus black men are not known (Palicka and Rhodes, 2010).

2.8 MANAGEMENT OF ACRAL MELANOCYTIC NEVI

Koga and Saida, (2011) developed a clinical protocol for the management of AMN. Suspicious nevi should be evaluated dermoscopically for the parallel ridge pattern. If the parallel ridge pattern is present, the lesion should be biopsied. If the pattern is absent, the lesion should be evaluated for the presence of benign dermoscopic patterns.

If benign dermoscopic patterns are present, the patient needs no further follow-up. If absent, the diameter of the lesion must be measured. If more than 7mmdiameter, the lesion should be biopsied for histopathologic evaluation. If less than 7 mm, no biopsy is necessary, but the patient must have regular clinical and dermoscopic follow-up (Koga and Saida, 2011).

2.9 CONCLUSION

This chapter presented a comprehensive literature review of AMN. Clinically, they are described in terms of their colour, size, shape, anatomical location and whether there are associated skin changes or not.

Findings from different authors show slight differences in the clinical features. The commonest colours reported by different researchers range from black to light brown, with some researchers reporting the presence of more than one colour in AMN, which is a clinical feature that is associated with AM. In terms of size, most researchers report AMN with a diameter of <7mm, (a diameter of > 7mm is a suspicious feature associated with AM). However Palicka and Rhodes, (2010) reported diameters of 0.5 to 8.0 mm for palmar AMN, 1.0 to 10.0 mm for plantar AMN. Similarly, Gill et al., (2015) reported diameters 3mm to 13.5mm for plantar AMN in a cohort of 39 African American patients. These findings demonstrate that AMN in Blacks tend to be larger in diameter, whether this is risk factor for AM or not is unknown. It is also not known

whether the 7 mm cut-off point for AMN versus AM should be applied to Blacks, as it is to Whites.

Dermoscopically they are described in terms of the dermoscopic pattern they exhibit. Research publications show that the parallel furrow, lattice-like, fibrillar, nontypical, reticular, globular, transition and homogeneous patterns are the most commonly reported patterns for AMN. The parallel ridge pattern is associated with AM.

The clinical and dermoscopic features are comprehensively studied in white-skinned individuals, leaving a gap in terms of their appearances in dark-skinned individuals. The handful of studies done in dark-skinned individuals suggest that there are clinical and dermoscopic differences between the two groups as well as differences between different genders. The next chapter will present the research methodology used.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 INTRODUCTION

This chapter will describe the methodology followed in conducting this research, the research design, the sampling methods used to determine a representative sample size, data collection methods and tools, and how the data was collected, summarised and analysed. Ethical issues related to the study are discussed.

3.2 RESEARCH METHOD

This was a quantitative cross-sectional study. Cross-sectional studies analyse data of various variables that are collected at a single point in time (Johnson, 2018). Data was collected prospectively from patients attending the Dermatology Outpatients' Department at Pietersburg Hospital. The quantitative approach was chosen because it allows quantifying variables and determination of relationships between independent and dependent variables.

3.3 RESEARCH DESIGN

3.3.1 Study Population and Sampling

3.3.1.1 Study Population and Site

A study population is a portion of the total target population, from which the sample is selected (Johnson, 2018). The target population included all adult African patients (18 years and older) attending the dermatology clinic at Pietersburg Hospital. Pietersburg Hospital is a tertiary-level academic hospital and is the referral site for 30 district hospitals. The hospital serves an estimated population of 6,015 million people in Limpopo Province (Tun, 2022.). An area map of the research site is given in Figure 3.1.

Figure 3.1 Study site: Map of Limpopo province and location of Polokwane Hospital (red circle) (Monticelli, Mbatha, Moyo, Ogunmefun and English, 2012)

3.3.1.2 Sampling

Sampling is defined as the process of selecting a representative group of individuals from the population under study (Martínez-Mesa, González-Chica, Duquia, Bonamigo and Bastos, 2016). A consecutive sampling method was adopted in the study. In consecutive sampling, every person meeting the inclusion criteria for the study is recruited until the required sample size is achieved (Martínez-Mesa., 2016). This method was chosen as it is cost effective and makes the process easy for the researcher to access participants that fit the inclusion criteria.

3.3.1.3 Ethical issues related to sampling

Reliability, validity and objectivity

Reliability is defined as the consistency of a measure, whether the measure is used during different times or is used by different researchers, it should give the same result

repeatedly (Drost, 2011). The measures used were clinical and dermoscopic descriptions of AMN. The researcher is a registrar in dermatology and the supervisor is a consultant dermatologist with many years of experience in the field. The variables measured in the clinical and dermoscopic examinations are very well defined and standardised in the medical and dermatology literature, and routinely used by most dermatologists to describe melanocytic nevi.Validity is the extent to which an instrument measures what it purports to measure (Drost, 2011). The data collection tool used in the study is an adaptation of an instrument that has been used by Palicka and Rhodes (2010), in a similar study.

The researcher consulted an expert in statistical methods, to reach a sample size with enough statistical power to ensure validity. The researcher's supervisor is an experienced dermatologist, was on hand to assist with any challenges encountered during data collection. As an example, whilst reviewing photos of red AMN and arciform AMN, the supervisor demanded that further literature research be conducted to compare and contrast published reports on the unusual shape and colour of these AMN.Scientific objectivity is concerned with the idea that claims, methods and results of science should not be influenced by particular perspectives, value commitments or personal interests (Reiss and Sprenger, 2014). Objectivity was achieved by strictly applying well-established clinical and dermoscopic descriptive terms for AMN used in dermatology literature and practice (Annexure 2).

Bias

Bias is any deviation from the truth, and can occur during data collection, data analysis and data interpretation and may lead to false conclusions It may be intentional or unintentional (Gardenier and Resnik, 2002). To prevent selection bias, the consecutive sampling method was used, ensuring that no patient within the inclusion criteria was missed. Additionally, a large enough representative study population was selected.

To minimise researcher bias, the researcher took clinical and dermoscopic photos of all the lesions described, and reviewed them with the supervisor or other colleagues, where uncertainty occurred. The colleagues are qualified and certified medical doctors with specialist training in dermatology, working in an institution accredited to provide academic training to postgraduate dermatology registrars.

3.3.1.4 Sample

The Dermatology Department sees an average of 300 adult African patients monthly as outpatients. Over three months, the population was calculated to be 900 patients. The Krejcie and Morgan sample table (Annexure 3) was used to determine a representative sample size (Krejcie and Morgan, 1970). Using this table, on a population size of 900 patients, a confidence level of 95%, a margin of error of 5% and a population proportion of 50%, the sample size was 269 patients.

3.3.1.5 Inclusion and exclusion criteria

Inclusion criteria

- All African patients aged 18 years or older, attending Pietersburg Hospital dermatology clinic, for any reason, with
- The presence of at least one well-demarcated pigmented lesion on the palm/s or sole/s.

Exclusion criteria

The following patients were excluded from the study:

- Patients under 18 years of age.
- Patients refusing to participate in the study.
- Caucasians and Asians.
- Patients with pigmented lesions on the palm and/or soles that are not melanocytic nevi.
- Patients with pigmented palmar and/or plantar lesions with ill-defined borders.

3.3.2 Data collection

3.3.2.1 Data collection approach and method

Both new and old patients visiting the dermatology clinic at Pietersburg Hospital were recruited, and the data collection approach consisted of clinical examination of each

participant and documentation of data using an adapted data collection tool. This was followed by dermoscopic evaluation of the pigmented lesions and same was captured on the research instrument. Informed consent was obtained prior to collection of data.

3.3.2.2 Development and testing of the data collection instrument

During the literature review phase of this study, a number of similar studies were critically reviewed. The data collection instrument used in the study (Annexure 2) was an adaptation of one which was used by Palicka and Rhodes (2010). A pilot study was not performed as the tool was an adaptation of an instrument that had been successfully used before. The researcher encountered no challenges with the instrument during data collection.

3.3.2.3 Characteristics of the data collection instrument

The data collection sheet was composed of sections A, B and C. Section A consisted of 4 questions on demographic data; section B had 9 questions on clinical features; and section C focused on dermoscopic characteristics.

3.3.2.4 Data collection process

Data was collected prospectively during the participants' normal clinic visit. The entire process took between five and ten additional minutes to the patient's normal consulting time. The researcher identified patients who satisfied the inclusion criteria for the study during their routine clinic visit, and explained the objectives of the study to them. They were each given an opportunity to read the informed consent forms before consenting or declining to partake in the study. Non-consenting patients were offered their routine clinical care services. Consenting patients were then asked to provide specific demographic data, which was captured onto the data collection sheet.

Participants' AMN were thereafter examined by the researcher, if a participant had more than one AMN, the largest diameter nevus was selected for examination. The relevant clinical variables were then captured onto the data collection instrument. All clinical images of AMN were photographed with the Canon EOS 2000D camera. This was followed by a dermoscopic examination of the AMN, using the "DermLite Foto II Pro - 3Gen" dermoscope. The dermoscopic pattern was captured onto the data

collection sheet and the dermoscopic images were photographed using the Nikon D500 camera. A tape measure was on hand to measure the different sizes of the nevi.

The data collection took approximately 07 months to complete, from April 2023 until end of October 2023. The completed data collection sheets were stored in a locked cabinet in the dermatology department, and the photographic data was stored electronically in a computer.

3.3.2.5 Ethical considerations related to data collection

Permission to conduct the study

Prior to commencing the study, all statutory and legal permissions were requested and obtained. These included ethical clearance certificates from Turfloop Research Ethics Committee (Annexure 10), and from the Limpopo Department of Health (Annexure 11) and the Chief Executive Officer (CEO) of Pietersburg Hospital (Annexure 12).

Informed consent and voluntary participation

Informed consent was obtained from all participants. The consent forms were available in English, Sepedi, Xitsonga and Tshivenda, the predominant languages in the clinic. Patients refusing to enrol were not discriminated in any way and continued with their normal clinic consultation.

Anonymity

Participants remained anonymous. No names or surnames were used to identify participants; instead numbered codes were generated and allocated to each participant during data collection. No images of the face or any identifying features were taken on participants.

Privacy and confidentiality

Examination of participants was in a private consultation room and the raw data was handled by the researcher only.

Beneficence

Beneficence is an ethical principle that puts an obligation on researchers to perform research that will benefit research participants and society at large (DeRenzo, Singer and Moss, 2020). During this study, there were patients who had suspicious clinical or dermoscopic features that were identified. These participants were managed as according to the three-step algorithm discussed above. Through this research and use of the algorithm, one of the patients was found to have an acral melanoma and was subsequently managed appropriately. The findings of the study will add to the body of knowledge in the field of dermatology and across disciplines.

Non-maleficence

Non-maleficence is the ethical principle that dictates that no harm should come to a patient as a result of their participation in a research project (DeRenzo, Singer and Moss, 2020). This study occurred during patients' normal dermatology consultation appointment so no additional financial burden additional financial burden was incurred by the participants. However, there was an additional five to ten minutes consultation time added.

3.3.3 Data analysis

Data was captured on an excel spreadsheet and analysed on SPSS version 26. Descriptive statistics were used to organise and summarise the captured data. Continuous variables were expressed as the mean and standard deviations, whilst categorical variables were expressed as frequencies and percentages. The Chi-squared test was used to determine the association between acral melanocytic nevi and demographics such as age and gender. Significance was assessed if p-value was less than 0.05 (< 0.05). The results were represented in the form of tables and charts.

3.4 INTERNAL AND EXTERNAL VALIDITY OF THE STUDY

Validity is defined by Drost (2011) as the extent to which an instrument measures what it purports to measure. Accurate data is crucial in ensuring meaningful research. Accuracy is defined as the closeness of the measured value to the true value and precision is how consistent results are when measurements are repeated (Trajkovic,

2008). The data collection tool was an adaptation of an instrument that has been used by in a similar study by Palicka and Rhodes (2010). Additionally, extensive literature review informed the development of the research instrument for the proposed study. The researcher worked with experts in statistical methods, in order to reach a representative sample size with enough statistical power to ensure validity.

External validity is a measure of the extent to which a study's results can be generalised to apply to people in a setting different from the study setting (Patino et al., 2018). The study sample size was large enough so as to ensure external validity, though it was confined to adult, African patients at Pietersburg Hospital.

3.5. CONCLUSION

This chapter outlined the research methodology followed in selecting a research design, recruiting participants, sampling, data collection, data storage, data analysis and validity. Ethical principles were followed throughout. The following chapter will present the research findings.

CHAPTER 4

PRESENTATION AND DISCUSSION OF RESULTS

4.1 INTRODUCTION

This chapter presents the study findings, followed by a discussion in accordance with the study objectives, which are listed below:

To describe the clinical features of acral melanocytic nevi in African patients at Pietersburg Hospital.

To describe the dermoscopic features of acral melanocytic nevi in African patients at Pietersburg Hospital.

To determine the associations between the clinical and dermoscopic features of acral melanocytic nevi and demographics such as age and gender.

The results presentation will begin with the demographic data.

4.2 DATA MANAGEMENT AND ANALYSIS

Data was captured and analysed using the SPSS statistical programme version 26 after coding of variables. Descriptive statistics were used to organise and summarise the captured data. Categorical variables were expressed as frequencies and percentages. Continuous variables were expresses as the mean and standard deviations. The Chi-square was used to test the associations between acral melanocytic nevi and demographics such as age and gender.

4.3 RESEARCH RESULTS

4.3.1 Presentation of research findings

4.3.1.1 Demographic characteristics of participants

Gender

A total of 269 patients participated in the study, and 181 (67%) were female and 88 (33%) were male (Figure 4.1).

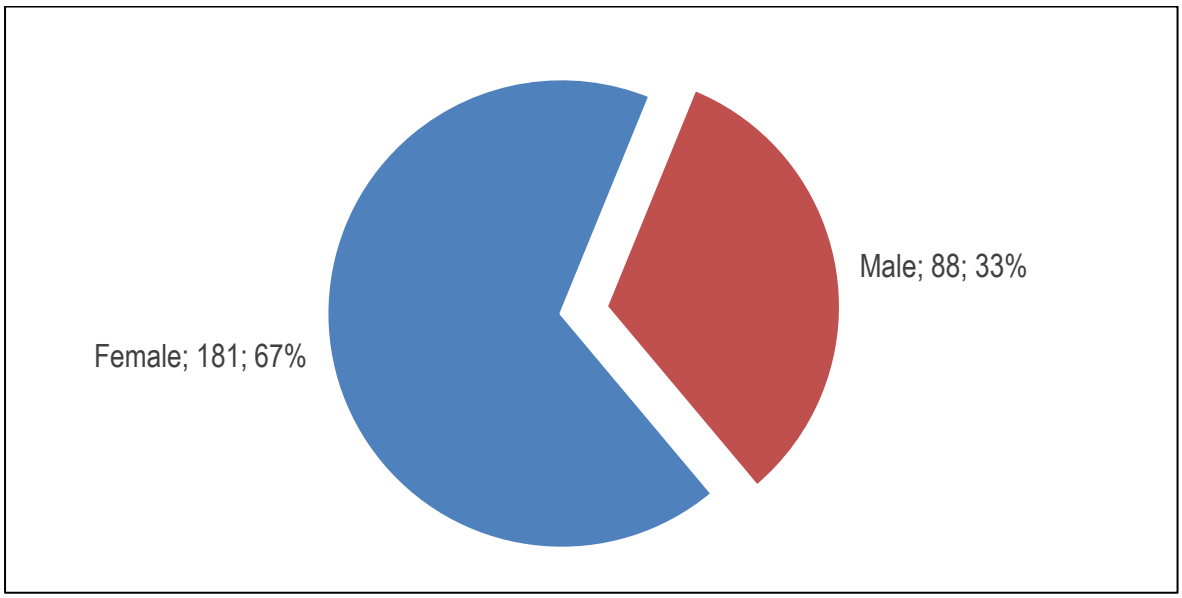


Figure 4.1 Gender distribution of participants

Age

The participants' ages ranged from 19 to 87 years, with a mean age of 37.1 and a standard deviation of 12.29 (Figure 4.2). The class with the highest frequency was class 30 – 39 with a frequency of 75 (27.9%).

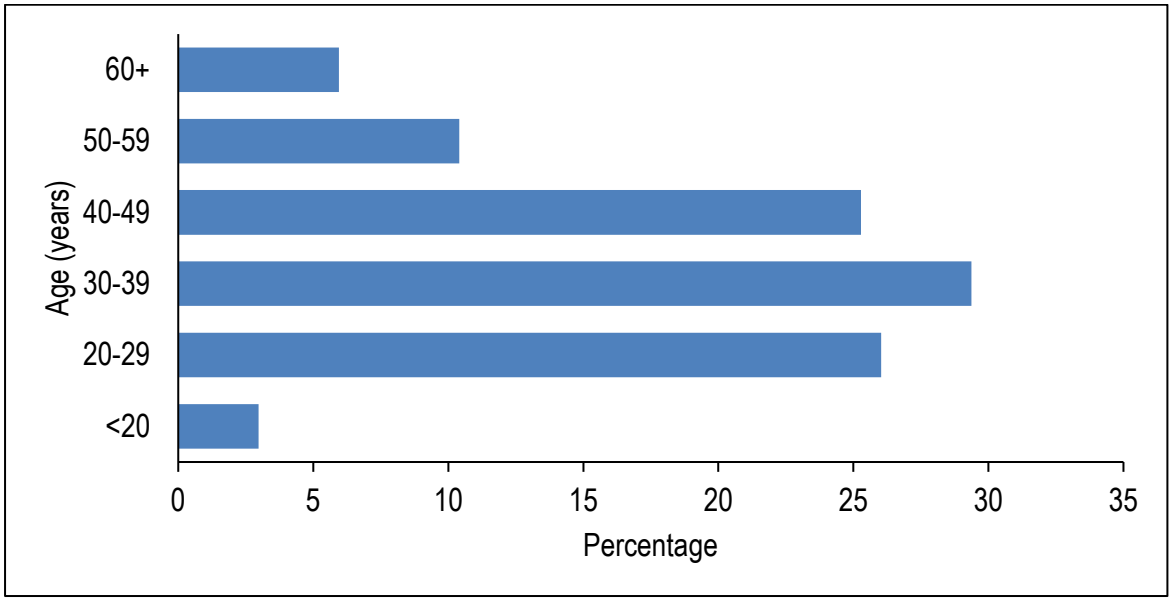


Figure 4.2 Age group distribution of participants (n=269)

4.3.1.2 Clinical Features of acral melanocytic nevi

The research findings on clinical features of the nevi are presented in Table 4.1.

Number of AMN

Majority of participants had less than 5 nevi (n=267, 99.26%), one participant had more than 10 AMN, all of which were on the palms (figure 4.3).

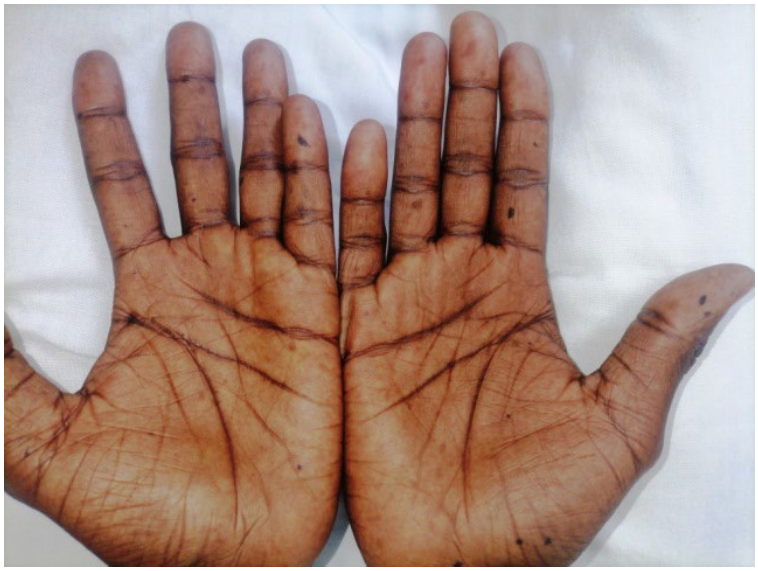


Figure 4.3 Participant with a high number (>10) of AMN

Morphology

Almost all the AMN were macules (99.26%), one nevus presented as an ulcerated plaque (Figure 4.4). This nevus was 20mm diameter, irregular shape, asymmetrical appearance, black colour, irregular well-defined borders, ulcerated surface and markedly raised to visual inspection and palpation. It displayed colour variegation with 2 shades of colours. This nevus displayed almost all the clinical features suspicious for malignancy.

Table 4.1 Clinical features of AMN (n=269)

Variable		N=269	%
Number of AMN	< five	267	99.26
	05 - 10	1	0.37
	11 - 20	1	0.37
Morphology	Macule	268	99.26
	Plaque & ulcerated	1	0.37
Anatomic Location	Palms	250	92.4
	Soles	19	7.06
Size/Diameter (mm)	1mm	7	2.6
	1-7mm	260	96.65
	7.1-10mm	1	0.37
	>10mm	1	0.37
Shape	Round & Symmetrical	147	54.6
	Round & Asymmetrical	8	3,0
	Oval & Symmetrical	76	28,3
	Oval & Asymmetry	15	5,6
	Irregular & Symmetrical	1	0,4
	Irregular & Asymmetry	20	7,4
	Other (arciform)	2	0,7
Colour	Brown	229	85.13
	Black	38	14.13
	Other (red)	2	0.74
Colour variegation	None	246	91.4
	1 shade	23	8.6
Presence of halo	Yes	17	6.3
	No	252	93.7
Border irregularity	Yes	57	21.2
	No	212	78.8
Border demarcation	Well-defined	211	78,4
	Ill defined	58	21.6
Surface changes	None	268	99.26
	Ulcerated	1	0.37
Topography	Flat	268	99.26
	Raised	1	0.37

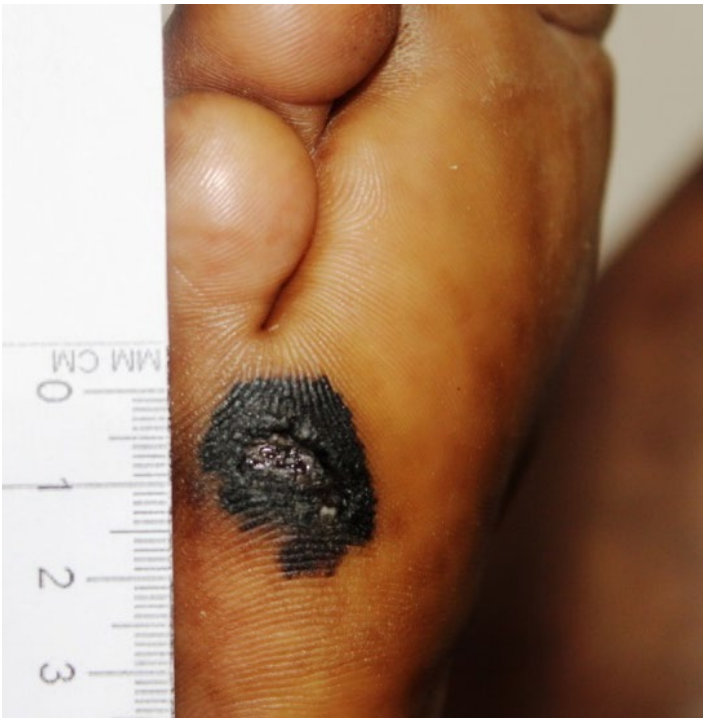


Figure 4.4. AMN presenting as an ulcerated plaque

Anatomic location

In 269 participants, the predominant anatomic location was the palms (n=*250*, 92.94%), with only 19 AMN observed on the soles (7.06%). On the palms, a slight majority was observed on the right palm (n=147, 58.8%), against 103 AMN (41.2%) occurring on the left palms. This observation was reversed on the soles, with more AMN observed on the left sole (n=11, 57.89%) versus the right sole (n=*08*, 42.11%).

Size

The diameters of the nevi ranged from 0.5mm to 20mm. In 99.26% of AMN, the diameter was < 7 mm. One participant had a nevus measuring 20mm (Figure 4.4) in diameter and another had one measuring 10mm (Figure 4.5).

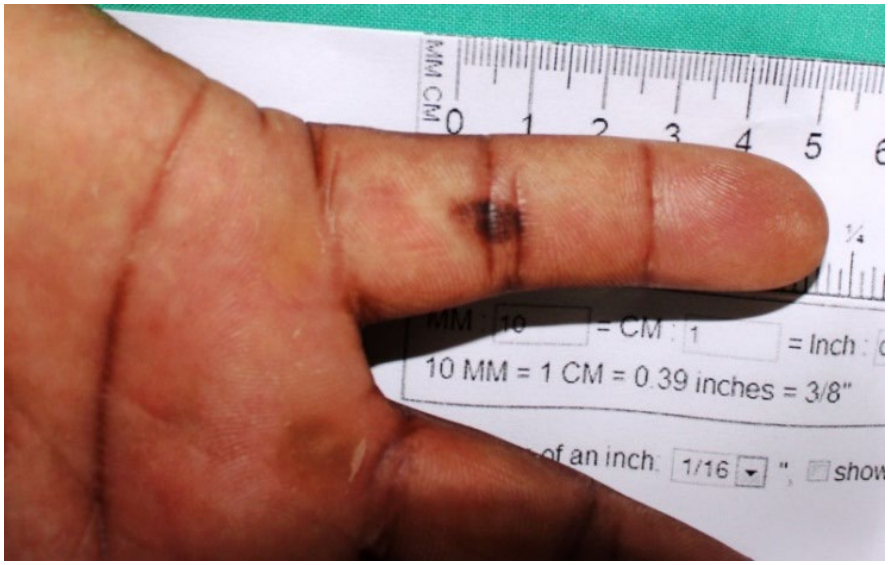


Figure 4.5 10mm AMN

Shape

The commonest shapes were round or oval. Symmetry was observed in 83.64% of the study participants, with 15.61% displaying an asymmetrical shape. Two nevi (n=2, 0.74%) with unusual curved or arcuate shape (Figure 4.6) were observed in two female participants.

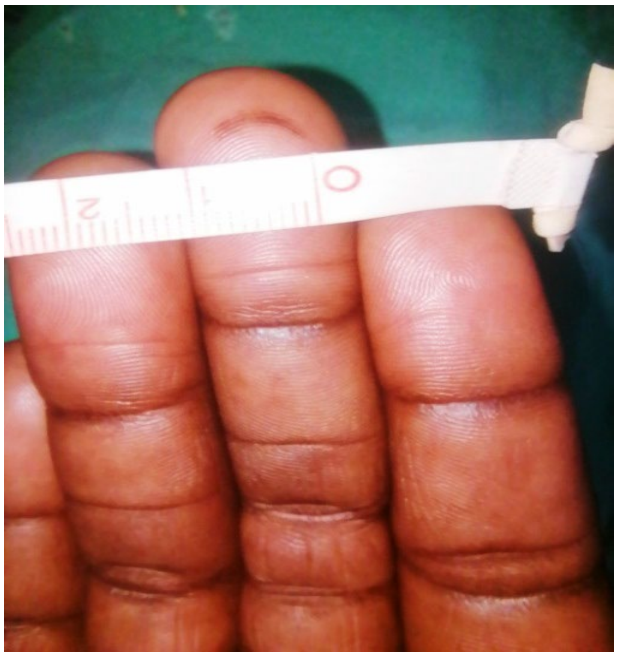


Figure 4.6 Arciform AMN

Colour

Two hundred and twenty nine (229) AMN (85.13%) showed varying degrees of brown (light brown, medium brown and dark brown), a black colour was seen in 38 participants (14.13%). An unusual colour was red AMN in two (0.74%) participants (Figure 4.7).

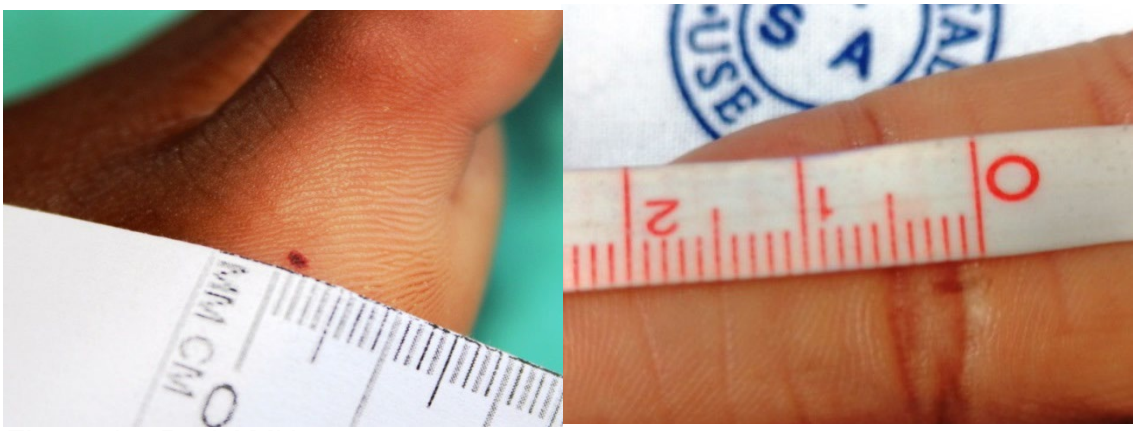


Figure 4.7 Red AMN

Colour variegation and presence of halo

The majority of our study participants (*n=246*, 91.4%) had no variegation in colour, whilst 8.6% demonstrated one shade of colour variegation (Figure 4.8).

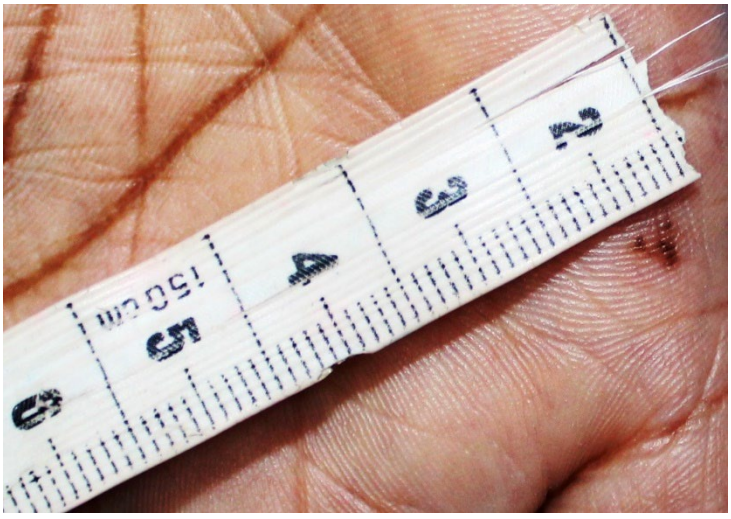


Figure 4.8 Colour variegation in a palmar AMN

There was a halo present (Figure 4.9) in 17 AMN (6.3%), and no halo was seen in 93.7% (n= 252) AMN.

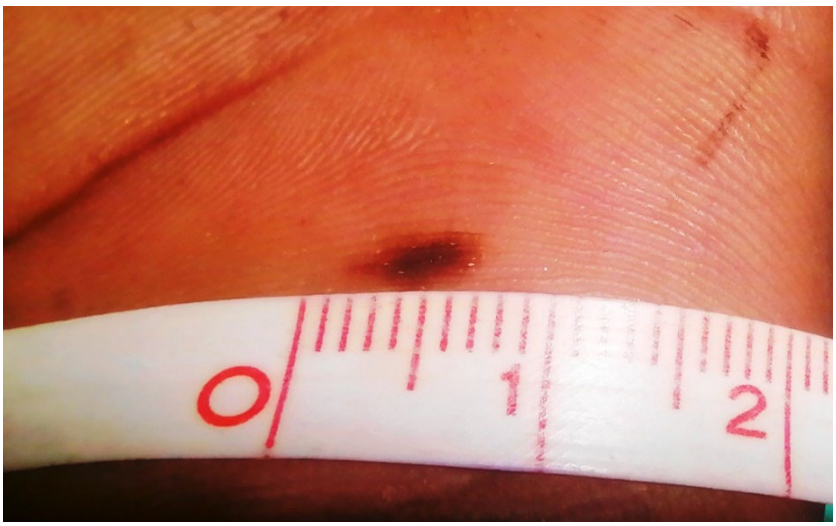


Figure 4.9 AMN with a surrounding halo

Border irregularity and demarcation

Well defined borders were observed in 78.4% of participants, and 78.8% had regular borders.

Surface changes

No surface changes were observed in 99.26% participants, and the only surface change observed (0.37%) was on the ulcerated AMN in Figure 4.4.

Topography

The nevi were flat in all but one participants (n=268, 99.26%) (Figure 4.4).

4.3.1.3 Dermoscopic features of AMN

The most frequently observed patterns were (Figures 4.10, 4.11, 4.12) parallel furrow pattern (n=*160*, 59.4%), globular pattern (*n=28*, 10.4%), fibrillar pattern (n=26, 9.7%), homogenous pattern (n=23, 8.6%) and lattice like patterns (n=17, 6.3%). The reticular pattern was seen in 11 AMN (4.1%), transitional pattern in 3 AMN (1.1%).

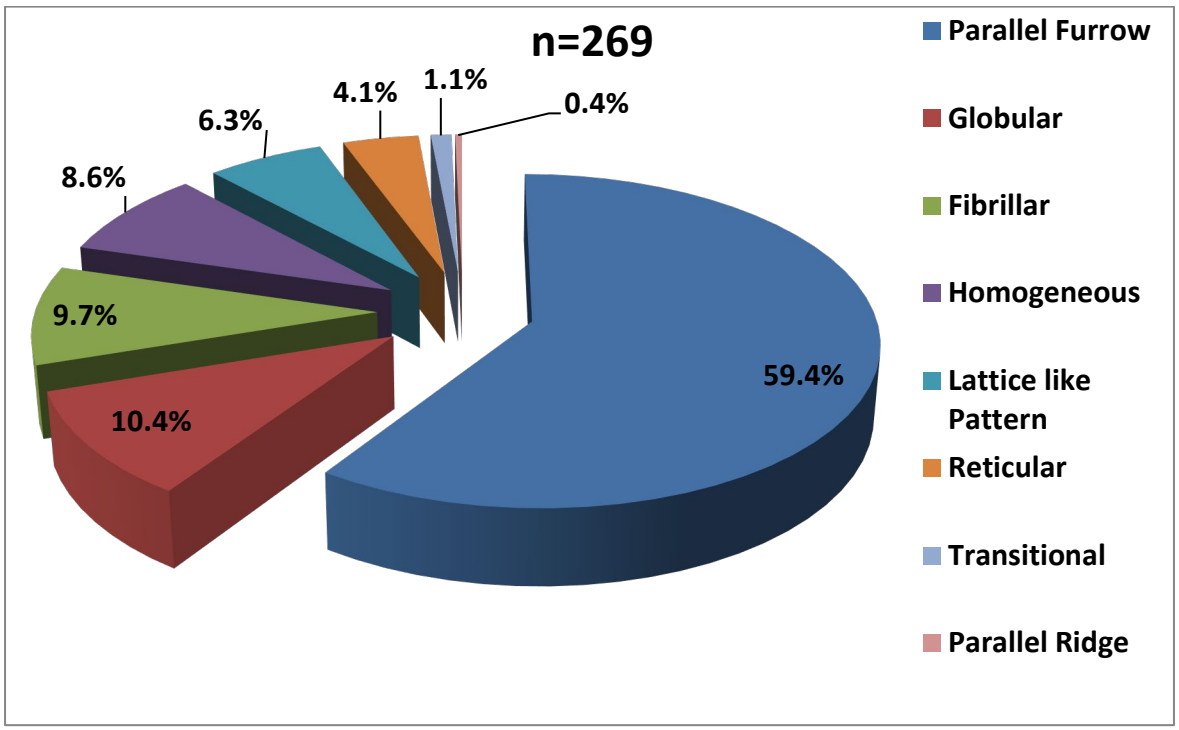


Figure 4.10 Dermoscopic features of AMN at Pietersburg Hospital

The parallel ridge pattern (PRP) was noted in one nevus (0.4%) (Figure 4.11).

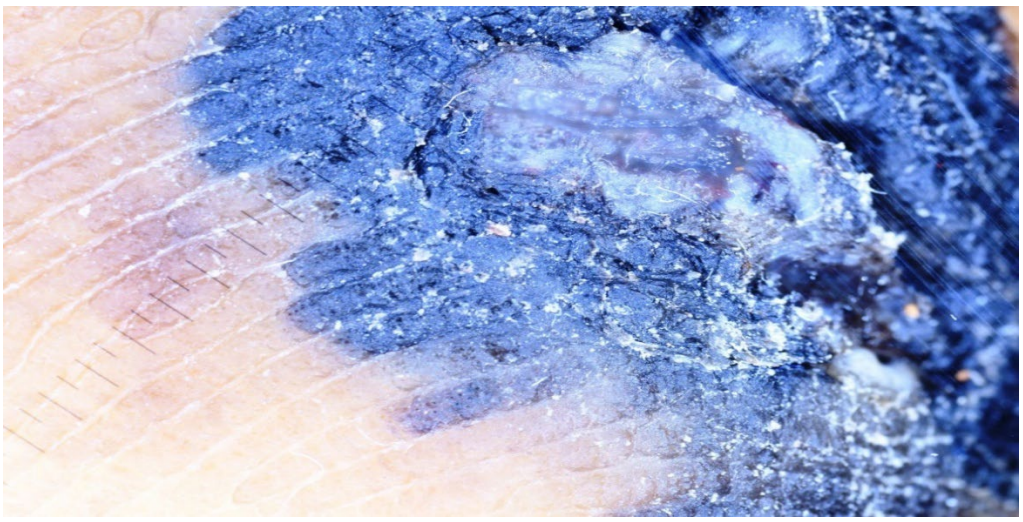


Figure 4.11 AMN demonstrating the parallel ridge pattern

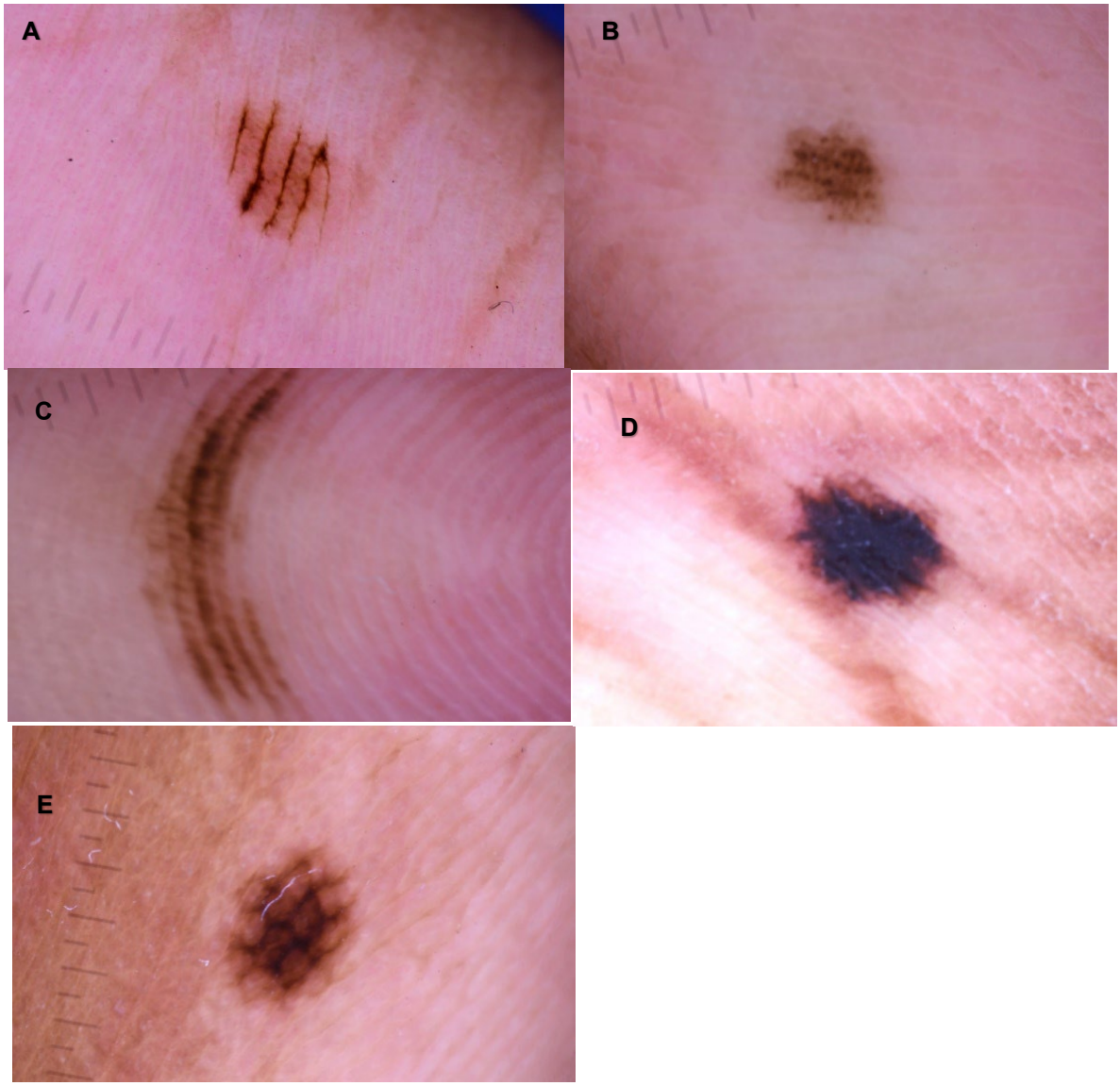


Figure 4.12 Most frequently observed dermoscopic patterns at Pietersburg Hospital: A. Parallel furrow, B. Globular, C. Fibrillar, D. Homogenous and E. Lattice-like

4.3.1.4 Associations between clinical and dermoscopic features and demographic characteristics

Associations between dermoscopic features and gender.

Table 4.2 presents the association between gender and dermoscopic features. Almost all the dermoscopic features were not statistically significantly associated with gender

(p>0.05), with the exception of the fibrillar pattern. The fibrillar pattern was found with a higher frequency in females (p=0.016), than in males.

Table 4.2: Associations between dermoscopic features and gender.

Dermoscopic features	Male, n=88	Female, n=181	p-value
*Fibrillar Pattern**	14(15.9)	12(6.6)	0.016
Globular Pattern	8(9.1)	19(10.5)	0.719
Homogeneous Pattern	5(5.7)	18(9.9)	0.241
Lattice-Like Pattern	7(7.9)	10(5.5)	0.442
Parallel Furrow Pattern	51(57.9)	110(60.8)	0.658
Parallel Ridge Pattern	1(1.1)	0(0)	0.151
Reticular Pattern	1(1.1)	10(5.5)	0.088
Transition Pattern	1(1.1)	2(1.2)	0.982

* Statistically significant association

Associations between dermoscopic features and age.

Our study found the homogenous pattern to be significantly associated with age (p<0.05), and most prevalent in those aged 30-39 years (Table 4.3).

Table 4.3: Associations between dermoscopic features and age (N=269)

Dermoscopic features	**Age (years)**						**p-value**
	<20	20-29	30-39	40-49	50-59	60+	
Fibrillar Pattern	0(0.0)	6(8.6)	7(8.9)	7(10.3)	2(7.1)	4(25.0)	0.745
Globular Pattern	1(12.5)	8(11.4)	8(10.1)	6(8.8)	2(7.1)	2(12.5)	0.950
Homogeneous Pattern	1(12.5)	3(4.3)	13(16.5)	4(5.9)	0(0.0)	2(12.5)	0.026
Lattice-Like Pattern	1(12.5)	4(5.7)	7(8.9)	3(4.4)	1(3.6)	1(6.3)	0.679
Parallel Furrow Pattern	4(50.0)	46(65.7)	39(49.4)	46(67.7)	20(71.4)	6(37.5)	0.115
Parallel Ridge Pattern	0(0.0)	0(0.0)	0(0.0)	1(1.5)	0(0.0)	0(0.0)	0.397
Reticular Pattern	0(0.0)	1(1.4)	5(6.3)	1(1.5)	3(10.7)	1(6.3)	0.087
Transition Pattern	1(12.5)	2(2.9)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0.059
Total	**8**	**70**	**79**	**68**	**28**	**16**	

Associations between clinical features and demographics.

In terms of clinical features, the results revealed no statistically significant difference in respect of size of nevi, presence of halo, shape, colour, border irregularity and border demarcation between males and females ($p>0.05$, Table 4.4), and no statistically significant associations between clinical features and age (Table 4.5).

Table 4.4: Associations between clinical features and gender

Variable	Gender		p-value
	Male, n=88	Female, n=181	
Size of nevi (mm)			
<5	76(86.4)	159(87.9)	0.732
≥5	12(13.6)	22(12.2)	
Presence of halo			
Yes	8(9.1)	9(4.9)	0.193
No	80(90.9)	172(95.1)	
Shape			
Round & Symmetrical	41(46.6)	106(58.6)	0.266
Round & Asymmetrical	3(3.4)	5(2.8)	
Oval & Symmetrical	27(30.7)	49(27.1)	
Oval & Asymmetry	7(7.9)	8(4.4)	
Irregular & Symmetrical	1(1.1)	0(0.0)	
Irregular & Asymmetry	9(10.2)	11(6.1)	
Arciform	0(0.0)	2(1.1)	
Colour			
Light brown	23(26.1)	30(16.6)	0.097
Medium brown	16(18.2)	59(32.6)	
Dark brown	33(37.5)	66(36.5)	
Black	15(17.1)	25(13.8)	
Red	1(1.1)	1(0.6)	
Colour variegation			
None	76(93.9)	170(86.4)	0.038
1 Shape	12(6.1)	11(13.6)	
Border irregularity			
None	69(78.4)	143(79.0)	0.896
Slight	15(17.0)	28(15.5)	
Moderate	4(4.6)	9(4.9)	
Marked	0(0)	1(0.6)	
Border demarcation			
Well defined	70(79.6)	141(77.9)	0.933
Slightly ill-defined	8(9.0)	21(11.6)	
Moderately ill-defined	4(4.6)	7(3.9)	
Markedly ill-defined	6(6.8)	12(6.6)	

Table 4.5: Associations between clinical features and age (N=269)

	Age (years)						p-value
	<20	20-29	30-39	40-49	50-59	60+	
Size of nevi (mm)							
<5	6(75.0)	61(87.1)	69(87.3)	60(88.2)	24(85.7)	15(93.8)	0.872
≥5	2(25.0)	9(12.9)	10(12.7)	8(11.7)	4(14.3)	1(6.2)	
Shape							
Round & Symmetrical	3(37.50	36(51.4)	48(60.8)	35(51.5)	15(53.6)	10(62.5)	0.185
Round & Asymmetrical	0(0.0)	2(2.9)	2(2.5)	1(1.5)	1(3.6)	2(12.5)	
Oval & Symmetrical	2(25.0)	22(31.4)	17(21.5)	22(32.4)	9(32.1)	4(25.0)	
Oval & Asymmetry	3(37.5)	4(5.7)	3(3.8)	5(7.4)	0(0.0)	0(0.0)	
Irregular & Symmetrical	0(0.0)	0(0.0)	1(1.3)	0(0.0)	0(0.0)	0(0.0)	
Irregular & Asymmetry	0(0.0)	0(0.0)	2(2.5)	0(0.0)	0(0.0)	0(0.0)	
Arciform	0(0.0)	6(8.6)	6(7.6)	5(7.4)	3(10.7)	0(0.0)	
Colour							
Light brown	2(25.0)	16(22.9)	12(15.2)	17(25.0)	3(10.7)	3(19.8)	0.066
Medium brown	1(12.5)	16(22.9)	29(36.7)	19(27.9)	8(28.6)	2(12.5)	
Dark brown	2(25.0)	26(37.1)	25(31.7)	23(33.8)	14(50.0)	9(56.3)	
Black	2(25.0	11(15.7)	13(16.4)	9(13.2)	3(10.7)	2(12.5)	
Red	1(12.5)	1(1.4)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	
Colour variegation							
None	6(75.0)	67(95.7)	74(93.7)	58(85.3)	27(96.4)	24(87.5)	0.094
1 Shape	2(25.0)	3(4.3)	5(6.3)	10(14.7)	1(3.6)	2(12.5)	
Border irregularity							
None	4(50.0)	54(77.1)	63(79.8)	57(83.8)	22(78.6)	12(75.0)	0.353
Slight	4(50.0)	11(15.7)	13(16.5)	6(8.8)	6(21.4)	3(18.8)	
Moderate	0(0.0)	5(7.1)	2(2.5)	5(7.4)	0(0.0)	1(6.2)	
Marked	0(0.0)	0(0.0)	1(1.3)	0(0.0)	0(0.0)	0(0.0)	
Border demarcation							
Well defined	4(50.0)	55(78.6)	66(83.)5	51(75.0)	23(82.3)	12(75.0)	0.214
Slightly ill-defined	3(37.5)	8(11.4)	6(7.6)	7(710.3)	2(7.1)	3(18.8)	
Moderately ill-defined	0(0.0)	5(7.1)	4(5.1)	2(2.9)	0(0.0)	0(0.0)	
Markedly ill-defined	1(12.5)	2(2.9)	3(3.8)	8(11.8)	3(10.7)	1(6.2)	

4.3.2 Interpretation and discussion of research findings

The researcher's objectives for conducting this research was to determine the clinical and dermoscopic features of acral melanocytic nevi in African patients at Pietersburg Hospital, and furthermore investigate any associations between the clinical and dermoscopic features and demographics such as age and gender.

4.3.2.1 Demographics

Gender

In the sample of 269 participants, there was a large female predominance with a female to male ratio of 2:1. This was expected as women tend to outnumber men in the profiles of patients attending dermatology clinics (Dlova, Mankahla, Madala, Grobler, Tsoka-Gwegweni, and Hift, 2015).

Age

The participants' ages ranged from 19 to 87 years, with a mean age of 37.1 and a standard deviation of 12.29. Patients aged 18 or younger were excluded from the study. Our mean age was similar to other studies done with participants 18 years or younger excluded (Barquet et al., 2013).

4.3.2.2 Objective 1: Clinical features of acral melanocytic nevi

Clinical features routinely used in the literature to describe AMN worldwide include the anatomic location, size, shape, colour, presence or absence of colour variegation, presence or absence of a halo, borders, any surface changes and topography (Palicka and Rhodes, 2010).

Anatomic location

The predominant anatomic location was found to be the palms (n=*250*, 92.94%), with only 19 AMN observed on the soles (7.06%). Similarly González-Ramírez et al. (2018) found the predominant location of the nevi to be on the palms (83.5%) as opposed to the soles (16.5%). In a Turkish study of 1052 white participants, Madankumar et al. (2016) found 58.4% AMN on the palms versus 41.6% on the soles, and Ozdemir et al. (2007) found the frequency of palmar nevi to be 52.66% and plantar nevi, 47.34%. However, a study in a Polish population found AMN to be predominantly located on the soles (69.6%), with only 30.4% located on the palms (Wawrzynkiewicz, M., Pastuszczak, M., Chlebicki, M. and Wojas-Pelc, A., 2019).

Size

The vast majority (99.26%) of AMN were <7mm diameter, with diameters ranging from 0.5mm to 20mm. Palicka and Rhodes (2010) reported diameters of <7mm in 86.6% of AMN in Black participants, in whom the diameters of the nevi ranged from <1 to ≥9mm. Gill et al. (2015) found AMN diameters of 2.2mm to 13.5mm in Fitzpatrick skin type V and VI. It is noteworthy that the largest diameter was 20mm, which seems to be larger than in other studies.

Shape

The commonest shapes observed were round and symmetrical (n=147, 54.7%). A symmetrical shape was observed in 83.64% of the study participants. This is consistent with literature reports (Madankumar et al., 2016; Palicka and Rhodes, 2010; Gill et al., 2015; González-Ramírez et al., 2018).

An unusual shape was observed in two AMN (0.74%), which had a curved or arcuate shape. The nevi were each observed on the fingertips of two separate female participants aged 39 and 35 years (Figures 4.6 and 4.9 C). Like arcuate AMN, longitudinal or linear shapes are uncommon and have been rarely described. Frances

et al. (2015) described longitudinal AMN in a series of 9 patients. Four nevi were on the fingers and 5 were on the soles. It was hypothesised that the linear shape could be due to the distribution of melanocytes following the lines of Blaschko on the acral skin (Frances, Blanes, Leiva-Salinas and Bañuls, 2015). Considering the location and curved shape in the two cases, it can be hypothesised that these AMN are related or influenced by the dermatoglyphics.

Colour

Among 229 AMN, 85.13% had varying degrees of brown (light brown, medium brown and dark brown), and a black colour was observed in 38 participants (14.13%). Studies conducted in dark-skinned individuals have reported the commonest colour for AMN as brown to dark brown (Palicka and Rhodes, 2010; Gill et al., 2015). Esener, Sarenur and Mevlitoğlu (2019) reported the colour variation as 40% light brown, 59% dark-brown, 1% blue and 0% black in a Turkish study.

An unusual colour (for dark skinned people) was the observation of red AMN in two (0.74%) participants (Figure 4.7). The bright red colour elicited suspicions of a subcorneal hematoma, but the paring test failed to remove the red pigment, and the lesions could be examined dermoscopically and were found to not have a PRP, which is seen in a subcorneal hematoma, thus confirming the lesions as an AMN. To the researcher's knowledge, this is the first report of red AMN in dark skinned individuals.

Colour variegation

There was no colour variegation in 91.4% participants (n=246), and 8.6% demonstrated one shade of colour variegation. None demonstrated two or three shades colour variegation. Comparing the research data to the findings from Palicka and Rhodes (2010), in their cohort of black skinned participants, 54% demonstrated no colour variegation, 38% had one shade colour variegation, 6% demonstrated two shades and 2% demonstrated three or more shades colour variegation.

Borders

Well defined borders were observed in 78.4% of participants, and 78.8% had regular borders. In melanocytic nevi occurring on non-acral skin, the presence of colour variegation, border irregularity and ill-defined borders may be suspicious features (Ahnlide, I., Bjellerup, M., Nilsson, F. and Nielsen, K., 2016) for melanoma.

Topography

The topography was flat in 99.26% participants had flat AMN, and only 1 (0.37%) was raised. AMN are flat and only a small percentage may be elevated. In the study by Palicka and Rhodes (2010), all participants had flat AMN.

4.3.2.3 O*bjective 2: Dermoscopic features of acral melanocytic nevi.*

The study found eight dermoscopic patterns, reported in decreasing order of frequency: PFP (n=160, 59.4%), GP (n=28, 10.4%), FP (n=26, 9.7%), HP (n=23, 8.6%), LLP (n=17, 6.3%), RP (n=11, 4.1%), TP (n=3, 1.1%) and PRP (n=1, 0.37%).

The frequency of the PFP was consistent with a Turkish study of 260 AMN (Karaca et al., 2021) in which 12 dermoscopic patterns were observed and the PFP had the highest frequency of 51.5%, and PRP, the lowest frequency of 1.2% (n=3) (Table 4.6). Serrano et al., (2015) described the frequencies of 39 AMN in African Americans residing in Chicago and found that the PFP pattern was the most prevalent (66.7%), next was NTP (15.4%), and LLP (7.7%). On the other hand, the second most common pattern in this study, the GP (10.4%), had a frequency of 3.5% in the Karaca et al. study. The PFP is also the commonest pattern amongst Asian, European and non-black Americans (Malvehy and Puig, 2004, Altamura et al., 2006, Ozdemir et al., 2007, Barquet et al., 2013, González-Ramírez et al., 2018). Therefore, it can be concluded that the PFP is the most common dermoscopic pattern observed in volar AMN.

The second most frequent pattern found by this study was the GP (n=28, 10.4%). Other studies report this pattern with a much lower frequency. Karaca et al., (2021) reported the GP as sixth commonest, Gill et al., (2015) reported it as seventh commonest and Serrano et al., (2015) as fourth commonest.

The FP was the third most common with a frequency of 9.7%. In contrast, the pattern was found to be most frequently observed (34.9%) in a study by Gill et al., (2015) involving 39 African American participants. However, Serrano et al., (2015) observed FP in only 2.6% of the cases. Nonetheless, most publications report either the FP, LLP or HP as the second most frequent pattern (Ozdemir et al., 2007, Barquet et al., 2013, González-Ramírez et al., 2018).

With a frequency of 0.37% in this study, PRP has shown to be uncommon in most studies (Table 4.6), indicating a low possibility of malignant transformation to melanoma. This study found one case with the PRP (Figure 4.11). Following the 3-step-algorithm, the nevus was biopsied for histopathological evaluation and a diagnosis of acral lentiginous melanoma was confirmed. It is compelling that the only PRP case was confirmed to be a melanoma. It is therefore obligatory that, unless it is declined, a biopsy of all AMN with a PRP is performed. The 3 (1.2%) participants in the Karaca et al. study (2021) reportedly refused biopsies, and so AM could not be confirmed or ruled out. The studies by González-Ramírez et al., (2018), Gill et al., (2015), Serrano et al. (2015) and Barquet et al. (2013) did not report on the finding of a PRP.

Table 4.6: Dermoscopic patterns of AMN reported in different studies.

Author	This study	Karaca et al.	González-Ramírez et al.	Gill et al.	Serrano et al.	Barquet et al.
Site	Pietersburg	Turkey	Mexico	Detroit	Chicago	Uruguay
Year	2023	2021	2018	2015	2015	2013
n	269	260	502	45	39	158
Pattern	%	%	%	%	%	%
PFP	59.4	51.5	62.4	13.9	66.7	51.3
GP	10.4	3.5	2	7	2.6	9.5
FP	9.7	6.5	6.6	34.9	2.6	7
HP	8.6	7.7	9.2	14	2.6	12.7
LLP	6.3	13.5	8.8	9.3	7.5	13.3
RP	4.1	1.2	5.8	-	-	-
TP	1.1	1.5	3	2.3	-	-
PRP	0.4	1.2	-	-	-	-
GSL	-	1.9	-	-	2.6	3.8
NTP	-	3.5	2	9.3	15.4	2.5
MCP	-	8.1	0.2	9.3	-	-
TOTAL	100	100	100	100	100	100

PFP (parallel furrow), GP (Globular), FP (Fibrillar), HP (Homogenous), LLP (Lattice-like), RP (Reticular), TP (Transition), PRP (Parallel ridge), GSL (Globulo-streak), NTP (Non-typical), MCP (Mixed component).

4.3.2.4 Objective 3: Associations between the clinical and dermoscopic features of acral melanocytic nevi and demographics.

The fibrillar pattern was found to be significantly higher in females (p=0.016), than in males. Similar studies have not demonstrated any association between AMN patterns and gender. Karaca et al. (2021), found no statistically significant association between gender and dermoscopic features. Similarly, studies by Gill et al. (2015) and Serrano et al. (2015) did not report any associations.

This study found the homogenous pattern to be significantly associated with age (p<0.05), and most prevalent in those aged 30-39 years (n=13, 16.5%). The

homogenous pattern was found with a prevalence of 12.7% (Barquet et al. 2013), 9.3% (Altamura et al. 2006), and 7.7% (Karaca et al. 2021), however, these studies reported no association between this pattern and age. Whether these associations are specific for African individuals may be a subject of further research.

4.4 OVERVIEW OF RESEARCH FINDINGS

The sample size of the study was 269 with a female to male ratio of 2:1. Ages ranged from 19 to 87 years, with a mean age of 37.1 and a standard deviation of 12.29. The predominant anatomic location of the AMN was found to be the palms (n=250, 92.94%), with the vast majority (99.26%) of AMN measuring below 7mm diameter, and ranging from 0.5mm to 20mm. The commonest shapes observed were round or oval. A symmetrical shape was observed in 83.64% of our study participants, 85.13% AMN had varying degrees of brown (light brown, medium brown and dark brown), this is consistent with literature reports (Madankumar et al., 2016; Palicka and Rhodes, 2010; Gill et al., 2015; González-Ramírez et al., 2018).

The stand out finding was the observation of curved or arciform AMN. These shapes are rarely reported on in the literature and this researcher has not seen any reports of this shape in black-skinned individuals. Similarly, the observation of red AMN in two participants is the first report in skin of colour. One AMN was ulcerated.

Eight dermoscopic patterns were observed during this research. The top three were PFP (59.4%), GP (10.4%) and FP (9.7%). This study seems to confirm that the PFP is the most common dermoscopic pattern in both black and white people. One AMN with the PRP was observed in this study. The PRP is infrequently reported in the literature and is mainly associated with AM. Indeed the one AMN observed was confirmed as AM histopathologicaly. This study therefore adds further support to the practice of viewing the PRP with suspicion and promptly referring patients exhibiting this pattern (and other clinically suspicious features) for histopathological evaluation.

This study did not find any associations between the clinical findings and demographics such as age and gender. However, dermoscopically, the FP was found to be higher in females (p=0.016), than in males and the HP was significantly associated with age (p=0.026), and most prevalent in those aged 30-39 years, These associations have not been reported on in the reviewed literature available at the time of writing this manuscript. It is an unexpected observation and it would be interesting what future studies reveal.

4.5 CONCLUSION

In this chapter, the study results were reported and discussed, in accordance with the study objectives. The study findings were contrasted with findings of similar studies in the literature and similarities or differences were discussed. The next chapter will provide a summary of the study, discuss limitations of the study and make recommendations for further studies.

CHAPTER 5

RECOMMENDATIONS AND CONCLUSIONS

5.1 INTRODUCTION

The study findings were presented and discussed in the preceding chapter. This chapter will summarise the study findings, discuss our study limitations and contributions made. The chapter will conclude by making recommendations for future studies.

5.2 RESEARCH DESIGN AND METHOD

This was a quantitative cross-sectional study of the clinical and dermoscopic features of acral melanocytic nevi in adult, African patients attending Pietersburg Hospital's Dermatology Out-patients Department, in Limpopo Province. The study population included all adult African patients attending this department. Using a consecutive sampling method**,** 269 participants were selected and agreed to be the study sample. Data were collected prospectively during clinic visits. Descriptive statistics were used to organise and summarise the captured data. The Chi-squared test was used to determine the association between acral melanocytic nevi and demographics such as age and gender. A p-value of less than 0.05 was considered significant.

5.3 INTERPRETATION OF RESEARCH FINDINGS

Two hundred and sixty nine participants comprised of 187 (69.5%) females, and 82 (30.5%) males enrolled for the study, which was a representative sample size as calculated by the Krejcie and Morgan sampling table. Participants' ages ranged from 19-87 years, excluding anyone below age 18, and the mean age was 37+/- 12.29.

The study found that the clinical features of acral melanocytic nevi in African black people are similar to other population groups in many respects except for the size, colour and shape. The researcher observed an AMN measuring 20mm diameter, a

significantly larger size than AMN reported in the literature. Two AMN (0.74%) had a curved/arcuate shape, which is an unusual shape and a similar but more linear shape was reported in one study by Frances et al., (2015). Two AMN (0.74%) exhibited a red colour, the first reported cases in skin of colour.

In terms of dermoscopic features, eight patterns were observed. These patterns were similar to patterns reported in the literature for Asian, European and American populations. What was intriguing was the association of the FP with female gender (p=0.016), and the association of the HP with the age group 30 – 39 (p=0.026). These associations haven't been reported before.

5.4 RECOMMENDATIONS

This study provided a basis for comparison for further similar studies in that it found that the clinical and dermoscopic features of ANM in adult African black people are similar to those reported for American, European and Asian people, the study furthermore confirmed the validity of using clinical features and dermoscopy in assessing AMN, thereby guiding management.

Future studies are recommended within similar patient populations, individuals younger than 18 years and in other provinces (African, black adults) in order to add to the knowledge gained here, and to ensure the results can be generalised to a larger population. Additionally, further studies should include pigmented lesions which do not strictly fit the definition of a melanocytic nevus.

It is recommended that associations between the homogenous pattern with age, and the fibrillar pattern with female gender be investigated further. These associations would need to be further investigated in other (younger) age groups.

5.5 CONTRIBUTIONS OF THE STUDY

To the best of the researcher's knowledge, this is the first study in Africa and South Africa to report on the clinical and dermoscopic features of AMN in dark skinned people, and the findings will contribute to the body of knowledge in dermatology.

The study highlighted benign and suspicious features, both clinically and dermoscopically. Furthermore, the study reported on rare clinical features not previously described, and a life was saved when an AMN turned out to be a melanoma in an unsuspecting patient.

5.6 LIMITATIONS OF THE STUDY

The findings of this study are from one dermatology centre in Limpopo Province, South Africa. This excludes all other adult African people in other South African provinces, who may have different or similar features. This study excluded anyone below the age of 18; AMN are not limited to adult people and a significant number occur in the paediatric population.

5.7 CONCLUSION

AMN classically have a regular, symmetric round or oval shape, well defined borders, one colour and a diameter < 7mm. These clinical features are considered benign. Indeed we found that the vast majority of the AMN in our study had these benign clinical features. Benign dermoscopic patterns are the parallel furrow, lattice-like, fibrillar, nontypical, reticular, globular, transition and homogeneous patterns. We observed similar patterns as reported by the literature. Our study findings are similar to reported studies in the literatures. Our study findings differed from reported studies in the observation of red AMN (n=2, 0.7%), and arciform AMN (n=2, 0.7%). These colour and shape are rare and have not previously been reported in the literature in dark skinned individuals, to the best of this researcher's knowledge. An additional surprise finding was the associations of the FP with the female gender and the HP with ages 30 to 39 years.

CHAPTER 6

SUMMARY AND CONCLUSIONS

6.1 **CHAPTERS SUMMARY**

6.1.1 Chapter 1

Chapter one gave an introduction to the study, with a brief section on the literature review highlighting the prevalence of AMN world-wide, within Africa and South Africa. It highlighted knowledge gaps with regard to AMN in the South African context, and defined the research problem. The study aims and objectives were outlined and the methodology used to reach the study objectives. The ethical considerations were also addressed and the significance of conducting this study was discussed.

6.1.2 Chapter 2

Chapter two was a comprehensive review of relevant, recent literature on AMN. The literature review discussed the prevalence, the clinical features and the dermoscopic features of AMN and AM. The associations between AMN and demographics and the management of AMN and AM were also discussed.

6.1.3 Chapter 3

This chapter discussed the research methodology followed, the research design, the sampling methods, data collection methods and data collection tools used and the data analysis. All the ethical issues related to good clinical practice were discussed.

6.1.4 Chapter 4

Chapter four was a presentation and discussion of the research findings. The genders and age groups of the study participants were reported. The clinical features of AMN were described in terms of; the total number of AMN per participant, the morphology , anatomic location, diameter (mm), shape, colour, presence or

absence of colour variegation, halo, borders and surface changes. The dermoscopic findings in 269 AMN were described. The Chi-square was used to test the associations between acral melanocytic nevi and demographics such as age and gender.

In summary our study found that, in two hundred sixty nine participants, there was a male to female ratio of 1:2.3, with a mean age of 37+/- 12.29. Clinically AMN presented most commonly as macules (99.6%), and were found predominantly on the palms as compared to the soles. 99.26% of AMN were < 7 mm diameter, most prevalent colours were brown (84.4%), and black (14.9%). Rare shapes (arciform) and colours (red AMN) were described. AMN demonstrated benign dermoscopic patterns in the majority (99.6%) of participants. Commonest patterns observed were PFP (59.9%), GP (10%) and FP (9.7%). The fibrillar pattern was found to be higher in males than in females ($p=0.016$), and the homogeneous pattern was significantly associated with age ($p<0.05$), found predominantly in those aged 30-39 years.

The study findings were then interpreted discussed and contrasted with results from similar studies reported in the literature.

6.1.5 Chapter 5

Chapter five provided an interpretation of the research findings, the recommendations for future studies, and the contributions and limitations of the study

6.2 CONCLUSION

The literature review revealed a paucity of published data on pigmented acral lesions in black African individuals as opposed to other population races. However, the clinical and dermoscopic features of AMN have predominantly been described in European, American and Asian populations, leaving a knowledge gap for African/black patients. The researcher therefore aimed to describe the clinical and dermoscopic features of acral melanocytic nevi in an African setting within patients at Pietersburg Hospital.

AMN in African patients is a special interest topic because of their high prevalence, and because AM is the commonest subtype of melanoma in black patients. South African clinicians, and especially dermatologists should be familiar with the clinical and dermoscopic features of AMN, especially in the black patient population, as this comprises the majority population seeking health interventions. Distinguishing between benign and suspicious features timeously is essential.

The aim of this study was to describe and document clinical and dermoscopic features of AMN in African patients and to determine associations with gender and age. This study has accomplished that and added to the knowledge base of clinicians and dermatologists within South Africa and Africa.

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LIST OF ANNEXURES

Annexure 1: Time Schedule

	2022				2023				2024	
	Sep	Oct	Nov	Dec	Jan	April	July	Oct	Jan	April
Literature review & preparation of research protocol										
Submission for Ethics approval										
Data collection										
Data analysis										
Report writing										

Annexure 2: Data Collection Sheet: (Adapted from Palicka and Rhodes, 2010)

Participant Code

SECTION A: DEMOGRAPHIC DATA

1. Age 2. Gender: Male Female

3. Family history of melanoma Yes No

4. Personal history of melanoma Yes No

SECTION B: CLINICAL CHARACTERISTICS

5. Number of nevi

A	< 5	
B	5 - 10	
C	11 - 20	
D	20 - 30	
E	> 30	

6. Morphology

A	Macule	
B	Papule	
C	Nodule	
D	Tumour	
E	Ulcerated	

7. Anatomic location

A Right palm	AA Thenar eminence	AB Hypothenar eminence	AC Volar aspects of the digits	AD Rest of the palm
B Left palm	BA Thenar eminence	BB Hypothenar eminence	BC Volar aspects of the digits	BD Rest of the palm
C Right sole	CA Arch	CB Heel	CC Volar aspects of the digits	CD Metatarsal sole
D Left sole	DA Arch	DB Heel	DC Volar aspects of the digits	DD Metatarsal sole

8. Size of largest nevus in millimetres (mm)

A Longest diameter

B Greatest perpendicular diameter

C Maximum estimated height

9. Shape

A	Round	AA	Symmetry	AB	Asymmetry
B	Oval	BA		BB	
C	Irregular	CA		CB	

10. Colour

A	Light brown	
B	Medium brown	
C	Dark brown	
D	Black	

11. Colour variegation

A	None	
B	1 shade	
C	2 shades	
D	≥ 3 shades	

12. Presence of halo (depigmentation around the nevus)

A	Yes	
B	No	

13. Border irregularity

A	None	
B	Slight	
C	Moderate	
D	Marked	

14. Border demarcation

A	Well defined	
B	Slightly ill-defined	
C	Moderately ill-defined	
D	Markedly ill-defined	

15. Surface changes

A	Scaly	
B	Eroded	
C	Ulcerated	
D	None	

16. Topography

A	Flat to tangential lighting	
B	Slightly raised to TL only (not palpable	
C	Slightly raised to visual inspection without TL or palpation	
D	Markedly raised to visual inspection and palpation	

SECTION C: DERMOSCOPIC CHARACTERISTICS

14. Pattern/s

A. Parallel Ridge ☐ G. Homogeneous ☐

B. Parallel Furrow ☐ H. Fibrillar ☐

C. Lattice like Pattern ☐ I. Multicomponent pattern ☐

D. Reticular ☐ J. Irregular Diffuse Pigmentation ☐

E. Globular ☐ K. Transitional ☐

F. Globulostreak-like pattern ☐ L. Other ☐

15. Other: Description

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Annexure 3: Krejcie and Morgan sampling table

Table for Determining Sample Size for a Given Population

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	181	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384

Note: "N" is population size
"S" is sample size.

Source: Krejcie & Morgan, 1970

Annexure 4: Consent form (English)

UNIVERSITY OF LIMPOPO (PMHC) CONSENT FORM

Statement concerning participation in a Research study

Name of Study: CLINICAL AND DERMOSCOPIC FEATURES OF ACRAL MELANOCYTIC NEVI IN AFRICAN PATIENTS AT PIETERSBURG HOSPITAL, LIMPOPO PROVINCE

Aim

This is a research project to look at pigmented lesions (dark spots) on the palms and soles in order to gather more information about these types of lesions seen in people from Limpopo

Objectives

The researcher will describe for the clinical appearance and the dermoscopic features (the appearance of the lesions when viewed with a special magnifying instrument called a dermoscope) of the pigmented lesions.
To determine the association between the clinical and dermoscopic features of the pigmented lesions and demographics such as age and gender.

The study procedures should take about 15 to 20 minutes on average will be followed by your usual consultation.

If during the examination the researcher notes something that suggests that a spot is dangerous you will be offered further treatment in addition to your usual consultation.

Participants' names, gender and age will remain anonymous and will not be disclosed. The study findings may be used in medical presentations and books, but the participants' personal information, including names, will remain confidential.

I have read the information on the aims and objectives of the proposed study and was

provided the opportunity to ask questions and given adequate time to rethink the issue. The aim and objectives of the study are sufficiently clear to me. I have not been pressurized to participate in any way.

I understand that participation in this Study is completely voluntary and that I may withdraw from it at any time and without supplying reasons. This will have no influence on the regular treatment that holds for my condition neither will it influence the care that I receive from my regular doctor.

I know that this Study has been approved by Pietersburg Mankweng Hospital Complex Ethics Committee. I am fully aware that the results of this Study will be used for scientific purposes and may be published. I agree to this, provided my privacy is guaranteed.

I hereby give consent to participate in this Study

....

Name of patient/volunteer Signature of patient or guardian

....

Place Date Witness

Statement by the Researcher

I provided verbal and/or written* information regarding this Trial / Study / Project*
I agree to answer any future questions concerning the Trial / Study / Project* as best as I am able.
I will adhere to the approved protocol.

.... ……. …….

Name of Researcher Signature Date Place

Annexure 5: Tokomane ya kgopelo ya tumelelo (Sepedi)

UNIVERSITY OF LIMPOPO (PMHC) CONSENT FORM

Polelo ka go tšea karolo mo go kakanyothema

Leina la Kakanyothema: BOEMO BJA MALWETŠI A LETLALO MO MATSOGONG LE MO MAOTONG A MA-AFRIKA BOOKELONG BJA PIETERSBURG

Tabakgolo

Tabakgolo ya dinyakišišo tša kakanyothema ye, ke go hlaloša maemo a malwetši a letlalo mo matsogong le mo maotong a ma-Afrika, bookelong bja Pietersburg. Malwetši a aletlalo mo matsogong le mo maotong a bitšwa:"acral melanocytic nevi".

Maikemišetšo

Go hlaloša dinhla-kgolo tša di ''acral melanocytic nevi" tša ma-Africa, bookelong bja Pietersburg, go ya ka hlahlobo ya ngaka.

Go hlaloša dinhla-kgolo tša di "acral melanocytic nevi" tša ma-Africa, bookelong bja Pietersburg, go ya ka hlahlobo ka "dermoscope".

Go humana kamano magareng ga dinhla-kgolo tša di "acral melanocytic nevi", le mengwaga goba bong, bja ma-Africa, bookelong bja Pietersburg.

Ke badile/ke baletšwe letlakala la tshedimošo ka ga tabakgolo le maikemišetšo a Kakanyothema yeo e akantšwego, ebile ke filwe le monyetla wa gore ke botšiše dipotšišo gomme ka ba ka fiwa le nako ya gore ke inaganišiše ka taba ye. Tabakgolo le Maikemišetšo a Kakanyothema ye di a kwišišega go nna. Ga ka gapeletšwa go tšea karolo.

Ke kwišiša gore go tšea karolo mo nyakišišong ye ke go ithaopa gomme nka tlogela go tšea karolo nako ye nngwe le ye nngwe ntle le go fa lebaka. Seo se kase be le tlhotloletšo go kalafo yaka. Ke a kwišiša Kakanyothema ye e dumeletšwe ke Pietersburg Mankweng Hospital Complex Ethics Committee. Ke tloga ke kwišiša gore dipoelo Kakanyothema ye di tlo šoma go oketša tsebo ya tša maphelo gomme di ka phatlalatšwa. Ke dumela se ge fela ke tshepišwa gore maina aka a tlaba sephiring.

Ke dumela go tšeya karolo mo morerong wo wa dinyakišišo.

....

Leina la motšeyakarolo Mosaeno wa motšeyakarolo

....

Lefelo Letšatši Paki

Lentšu ka monyakišiši

Ke file tsebo ka poleo le ka go ngwala mabapi le Kakanyothema ye.
Ke dumela go araba dipotšišo tšeo di kago latela ka moo nka kgonago mabapi le Kakanyothema ye.
Ke tla latela melao ya protocol ye.

…… …… …….. ……...……...

Leina la monyakišiši: Mosaeno Letšatši Lefelo

Annexure 6: Fomo ya Thendelo: (Tshivenda)

YUNIVESITHI YA LIMPOPO (PMHC) FOMO YA THENDELANO

Tshitatamennde tshine tsha kwama u di dzhenisa kha ngudo dza thoduluso.

Dzina la Ngudo: U LAVHELESIWA NA DZILAFHO LO FHELELAHO KHA VHULWADZE HA LUKANDA VHUNE HA KWAMA NGA NGOMU HA TSHANDA NA SOLO DZA MILENZHE KHA VHALWADZE VHA VHAREMA VHUONGELONI HA PIETERSBURG, VUNDUNI LA LIMPOPO.

Tshipikwa

Tshipikwa tsha ngudo idzi ndi u talutshedza lwo fhelelaho u toliwa na u lafhiwa kha vhulwadze ha lukanda lwa nga ngomu tshandani na solo dza milenzhe kha vhalwadze vha Vharema.

Zwine zwa khou todou swikeliwa

Thaluso yo fhelelaho ya u toliwa na dzilafho lo fhelelaho kha lukanda malugana na vhulwadze vhune ha kwama ngomu ha tshanda na solo dza milenzhe kha vhalwadze vha Vharema vhuongeloni ha Pietersburg.

Thaluso yo fhelelaho ya u toliwa ha tshiimo tsha lukanda kha vhalwadze vha Vharema vhuongeloni ha Pietersburg.

U vhona arali hu na vhushaka vhukati ha u toliwa na u lafhiwa ha tshiimo tsha lukanda ho sedziwa vhathu zwi tshi bva kha minwaha yavho na mbeu dzavho.

Ndo vhala zwidodombedzwa zwothe zwine zwa kwama zwipikwa na zwine ngudo idzi dzo dzinginywaho dza khou todou swikela zwone nahone ndo newa na tshikhala tsha u vhudzisa mbudziso na tshifhinga tsho linganaho tsha u humbula luvhili nga ha ngudo idzi. Tshipikwa na zwine ngudo idzi dza khou todou swikela zwone zwi khagala tshothe kha nne. A thongo newa mutsiko na muthihi kha uri ndi shele mulenzhe kha ngudo idzi.

Ndi a pfesesa uri u shela hanga mulenzhe kha Ngudo idzi ndi khou tou zwi ita nga u funa hanga nahone ndi nga di bvisa khadzo tshifhinga tshinwe na tshinwe ndi songo ranga nda nekedza mbuno dzanga. Hezwi a zwi nga vhi na thuthuwedzo na nthihi kha dzilafho langa la nga misi kha vhulwadze hanga kana u tutuwedza ndondolo ine nda

I wana kha dokotela wanga wa nga misi.

Ndi a zwi divha uri Ngudo idzi dzo themenndeliwa nga vha Pietersburg Mankweng Hospital Complex Ethics Committee. Ndi a divha lwo fhelelaho uri mvelelo dza Ngudo idzi dzi nga shumisiwa u itela ndivho dza scientifiki nahone dzi nga andadziwa. Ndi khou tendelana nazwo, tenda ha vha hu tshi khou khwathisedziwa tshiphiri tshanga.

Ndi khou neya thendelo ya u shela hanga mulenzhe kha hedzi Ngudo.

....

Dzina la mulwadze Tsaino ya mulwadze

....

Fhethu Datumu Thanzi

Tshitatamennde nga muiti wa Thoduluso dza ngudo:

Ndo nekedza vhutanzi ha mulomo na ho tou nwaliwaho malugana na Ndingo/Ngudo/Thandela iyi*
Ndi khou tenda uri ndi do fhindula mbudziso dzothe dzine dza nga taha tshifhingani tshi daho malugana na Ndingo/Ngudo/Thandela iyi* nga hune nda nga kona ngaho.
I will adhere to the approved protocol. Ndi do di badekanya na maitele othe o tendelwaho/ndi do tevhedzela maitele othe o tendeliwaho.

.... ……. …….

Dzina la mutodulusi Tsaino Datumu Fhethu

Annexure 7: Fomo yo nyika Mpfumelelo: (Xitsonga)

YUNIVHESITI YA LIMPOPO (PMHC) FOMO YO NYIKA MPFUMELELO

Statamente xo ngenelela ntwanano wa vulavisisi.

Vito ravulavisisi: VULAVISI BYA SWIVATI SWA NTIMA LEBYI ENDLIWEKE KAVA NTIMA, LEBYI KUMEKAKA ANDZENI KA MAVOKO NA LE HANSI KA MILENGE, A XIBHEDLELE XA PIETERSBURG A XIFUNZENI XA LIMPOPO.

Xikongomelo

Xikongomelo xa vulavisisi lebyi i ku hlamusela swivati swa ntima leswi kumekaka andzeni ka mavoko na le hansi ka milenge ya vanhu va ntima, a xibhedlele xa Pietersburg

Vutiyimiseri

Ku hlamusela vulasisi bya swivati swa ntima leswi kumekaka andzeni ka mavoko na le hansi ka milenge ya vanhu va ntima, a xibhedlele xa Pietersburg.

Ku hlamusela ku ri swivatisweswo swa ntima leswi kumekaka andzeni ka mavoko na le hansi ka milenge ya vanhu va ntimaa xibhedlele xa Pietersburg.

Ku hlamusela kuri swivati sweswo swa ntima swa ku kumeko ka swirho swihi swa vanhu va ntima kuri swi kumeka njani a mavokweni na le hansi ka milenge ngopfu ka vavanuna na vavasati hi kuya hi malembe ya vona.

Ndzi hlayile vuxokoxoko ka xikongomelo na vutiyimiseri bya vulasisi lebyindzi nyikiwe na nkarhi wo vutisa swivutiso na nkarhi lowu aneleke wo hleketesisa kahle hi mhaka leyi. Xikongomelo na vutiyimiseri bya vulavisisi lebyi se ni swi twisisa kahle, ani sindzisiwanga ku ngenelelahi ndlela yihi na yihi.

Ndza switwisisa leswaku ku ngenelela vulavisi lebyi hi wexe, na kuni ngatlhela ni huma nkarhi unwani na u wana a handle ko nyika nhlamuselo. Sweswo swi nge endli kuri ndzi nga ha kumi vuongori ka xiyimo kumbe swi endla kuri ndzi nga ha kumi ku ongoriwa lebyi ani byi kuma ka dokotela wa mina.

Na switwisisa leswaku swikumeko swa vulavisisi lebyi swi ta tirhiswa ka swilo swa Sainsi no kandzisiwa napfumela na leswi tende vuxokoxoko bya mina byi nga humeleli erivaleni.

Ndzi nyiketa mpfumelelo wo ngenelela ka vulasisi.

....

Vito ra muvabyi/mutihlawuri saini ya muvabyi/mutlhomeri

....

Ndzawu Siku Mboni

Statamente hi Mulavisisi

Ndzi pfumela hi nomo/hi ku tsala ka vuxokoxoko ka ku lavisisa.

Ndzi pfumela ku hlamula swivutiso hi vumundzeku mayelana na vulavisisi hi vuswikoti bya mina.

Ndzi ta landzela milawu hinkwayo.

..... ……. ……..… …….

Vito ra Mulavisisi Saina Siku Ndzawu

Annexure 8: School Senior Degrees Committee Approval Letter

University of Limpopo
Faculty of Health Sciences
School of Medicine

To: **Prof SM Risenga**
Director: School of Medicine

From: **Prof CJ Sutton**
Chairperson: School Senior Degrees Committee

Date: **25th July 2022**

Subject: **Submission of Master of Medicine in Dermatology Proposal**

A research proposal of Dr RA Molapo for Master of Medicine in Dermatology is hereby submitted for ratification by Faculty Higher Degrees Committee. The proposal was approved by the School Senior Degrees Committee on 25th July 2022.

Title: "Clinical and dermoscopic features of acral melanocytic nevi in African patients, Pietersburg Hospital."

Kind regards,

Prof CJ Sutton
Chairperson: School Senior Degrees Committee.

Annexure 9: Faculty Higher Degrees Committee Approval Letter

University of Limpopo
Faculty of Health Sciences
Executive Dean
Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 2149, Fax: (015) 268 2685, Email:tebogo.mothiba@ul.ac.za

DATE: 28 JULY 2022

NAME OF STUDENT: DR RA MOLAPO
STUDENT NUMBER: 19808108
DEPARTMENT: DERMATOLOGY
SCHOOL: MEDICINE
QUALIFICATION: MMED

Dear Student

FACULTY APPROVAL OF PROPOSAL (PROPOSAL NO. FHDC2022/5)

I have pleasure in informing you that your MMED proposal served at the Faculty Higher Degrees Meeting on 20 JULY 2022 and your title was approved as follows:

Approved Title: "Clinical and Dermoscopic features of Acral Melanocytic Nevi in African Patients, Pietersburg Hospital"

Note the following:

Ethical Clearance	Tick One
Requires no ethical clearance Proceed with the study	
Requires ethical clearance (TREC) (apply online) Proceed with the study only after receipt of ethical clearance certificate	√

Yours faithfully

Prof T.M Mothiba
Chairperson

Supervisor: Dr AR Sema-Ramashala

Annexure 10: Turfloop Research Ethics Committee Ethics Clearance Certificate

University of Limpopo
Department of Research Administration and Development
Private Bag X1106, Sovenga, 0727, South Africa
Tel: (015) 268 3935, Fax: (015) 268 2306, Email: anastasia.ngobe@ul.ac.za

TURFLOOP RESEARCH ETHICS COMMITTEE
ETHICS CLEARANCE CERTIFICATE

MEETING: 29 November 2022

PROJECT NUMBER: TREC/637/2022: PG
PROJECT:

Title:	Clinical and dermoscopic features of acral melanocytic nevi in African patients, Pietersburg Hospital.
Researcher:	RA Molapo
Supervisor:	Dr AR Sema-Ramashala
Co-supervisor:	N/A
School:	Medicine
Degree:	Master of Medicine in Dermatology

PROF D MAPOSA
CHAIRPERSON: TURFLOOP RESEARCH ETHICS COMMITTEE

The Turfloop Research Ethics Committee (TREC) is registered with the National Health Research Ethics Council, Registration Number: REC-0310111-031

Note:
i) This Ethics Clearance Certificate will be valid for one (1) year, as from the abovementioned date. Application for annual renewal (or annual review) need to be received by TREC one month before lapse of this period.
ii) Should any departure be contemplated from the research procedure as approved, the researcher(s) must re-submit the protocol to the committee, together with the Application for Amendment form.
iii) PLEASE QUOTE THE PROTOCOL NUMBER IN ALL ENQUIRIES.

Annexure 11: Approval to conduct a study from Limpopo Department of Health

The National Health Research Database

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Proposal Details: LP_202306_001

LIMPOPO HEALTH RESEARCH COMMITTEE

APPLICATION DETAILS

TITLE OF RESEARCH PROJECT

CLINICAL AND DERMOSCOPIC FEATURES OF ACRAL MELANOCYTIC NEVI IN AFRICAN PATIENTS, PIETERSBURG HOSPITAL

TYPE OF STUDY

Academic

STATUS OF APPLICATION

Approved

STATUS OF PROJECT

On-Going

PROPOSAL SUBMISSION DATE

2023/06/03

You will find a list of all comments made on the selected research application. The list below displays comments visible to both the Applicant and Research Committee

COMMENTS

Comment	Comment Date	Comment By

PRIMARY INVESTIGATOR OF THE PROJECT/PROPOSAL

Title	Name	Surname	Role	Institution	E-Mail	Telephone No.	Mobile No.	CV/Resume
DR	Antony	Molapo	Principal Investigator		antonymolapo@gmail.com	270123541105	270724113151	No File

RESEARCH STAFF ASSIGNED TO PROJECT/PROPOSAL

Title	Name	Surname	Role	Institution	E-Mail	Telephone No.	Mobile No.	CV/Resume

AIM AND OBJECTIVES

Annexure 12: Approval to conduct study at Pietersburg Hospital

LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
HEALTH
Pietersburg Hospital

REF : 4/2/2
ENQ : MOLOKOMME N
TO : DR MOLAPO RA
RESEARCHER
FROM : DR MC MASIPA
ACT CEO: PIETERSBURG HOSPITAL
DATE : 24 JULY 2023

RE : REQUEST FOR RESEARCH

1. The above matter refers.
2. Your request to conduct research is hereby granted.
3. You will be expected to avail the report to the institution upon completion.

Thanking you in advance

2023/07/24

DR MC MASIPA
ACTING CHIEF EXECUTIVE OFFICER
PIETERSBURG HOSPITAL

DATE