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DIAGNOSTIC DILEMMA OF BENIGN RECURRENT INTRAHEPATIC CHOLESTASIS IN PAPUA NEW GUINEA: A CASE REPORT

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ABSTRACT:

The first reported case of Benign Recurrent Intrahepatic Cholestasis (BRIC) in the South Pacific region proved to be a major clinical challenge at the Port Moresby General Hospital in Papua New Guinea. Given the rarity of the disease, it took over a decade of nonspecific medical interventions and patient distress before an actual diagnosis was made and appropriate treatment administered. The patient endured five bouts of the debilitating cholestatic episodes ranging from periods of three to six months durations prior to actual diagnosis of the disease condition was made. Diagnosis was based on pathognomic clinical presentations and the laboratory exclusion of other related conditions. Anti-cholestatic treatment combinations for BRIC administered during a sixth cholestatic episode had remarkable response. Subsequent pre-icteric symptoms were effectively managed with a periodic treatment protocol with resultant patient been symptom free for over a period of ten years to date (2007 – 2018). The positive management outcome of this case has established a better preventative therapeutic approach for BRIC.

Keywords: Benign recurrent intrahepatic cholestasis, jaundice,
Submitted April 2018, accepted October 2018

INTRODUCTION:

Benign recurrent intrahepatic cholestasis (BRIC) is a rare autosomal recessive disorder characterized by recurring episodes of cholestatic jaundice and pruritus [1]. Symptoms resolve spontaneously without any significant liver damage. This syndrome was first described by Summerskill and Walshe in 1959 [2], and further reports described its

characteristic early onset in 80% of the cases [3]. By 2009 there have were about 100 cases reported around the world [4, 5]. Follow-up cases from 17 to 50 years have shown lack of progression to end stage liver disease [6-8]. These recurring episodes which vary from a couple of weeks up to six months have had significantly detrimental effects on the quality of life of the patients.

Based on the genetic mutations two forms of BRIC have been reported. BRIC1 has a single gene mutation on *ATP8B1*, an aminophospholipid transporter, while BRIC2 involves a mutation in *ABCB11*, a bile salt exporter pump [9, 10]. In contrast, more severe phenotypes called progressive familial intrahepatic cholestasis types 1 and 2 (PFIC1 and PFIC2), which have mutations on the same genes with severe deficiencies of the transporters and tend to cause chronic end-stage liver damage which is fatal [4, 11]. BRIC is usually diagnosed after excluding PFICs and all other possible causes of hyperbilirubinaemia and elevated liver enzymes, coupled with the pathognomic clinical manifestations of recurrent jaundice and pruritus with intervals of total clinical and biochemical remission [12]. We report a case of adult onset of BRIC in Papua New Guinea (PNG) that proved to be a diagnostic dilemma and furthermore, report on the establishment of an effective non-invasive treatment approach.

CASE REPORT:

In 2007, a 33 year-old male who was asymptomatic presented to the Medical Science Research Centre, at the School of Medicine and Health Sciences, University of Papua New Guinea, with a prior history of five episodes of recurrent jaundice, associated with severe pruritus, impaired sleep, dark urine and pale stool. Each attack had lasted between 3 to 6 months with intervals of 1- 4 years of

complete clinical and biochemical remission. During the first 4 episodes between 1996 and 2003, he was managed by a team of surgeons in collaboration with physicians both in PNG and Australia as a case of “cholestasis of unknown origin” as no possible cause could be determined after series of routine biochemical, radiological and surgical tests. As such, trials of steroids, antibiotics and vitamin K were administered with no clinical or biochemical response. Hence, he was just observed in-hospital until clinical remission and discharge on all occasions.

The initial episodic attack occurred at the age of 20 years in 1996, prior to which he had an uneventful childhood and adolescence. During all the attacks (the initial five) the laboratory results for Liver Function Tests (LFT) showed markedly elevated transaminases and total bilirubin with predominant conjugated bilirubin (Table 1). The haemoglobin results were normal (between 14.4 to 16.5 g/dL), with normal Activated Partial Prothrombin Time (APTT) and prothrombin time (PT). Viral Hepatitis A and B, Human immunodeficiency virus (HIV), Coombs test and alpha fetoprotein were all negative; thus possible infective, autoimmune or malignant causes were excluded. Ultrasound reports showed stones in the gall bladder with no signs of obstruction in the biliary tree and a normal echotexture of the liver. These findings were further confirmed by CAT scan in 2003 following a fourth cholestatic episode. During the fourth attack in 2003, he

re-presented to the Greenslopes Private Hospital in Brisbane, Australia, where he had an endoscopic cholecystectomy done because of the presence of gall bladder stones despite any evidence of obstruction. A liver biopsy also done showed diffuse bile plugging

but no associated parenchymal damage or inflammation and was reported to be in favour of early extrahepatic cholestasis. The patient had a fifth cholestatic attack in 2005 which lasted for several months.

Table 1: Peak values of liver function tests for the patient during each episode of BRIC and the response to treatment.

Parameters LFT	Normal values	Episodes: Year & Month					
		1: 1996 Nov	2: 1998 Dec	3: 1999 Nov	4: 2003 Nov	5: 2005 Nov	6: 2008 Mar
Total Bilirubin ($\mu\text{mol/L}$)	2-22	410	530.7	87.7	14	112	53
Conjugated Bilirubin ($\mu\text{mol/L}$)	0-14	309	502	69.4	4.2	97	40
ALP* (U/L)	24-168	90	113	71	59	128	78
AST# (U/L)	30-50	60	1136	57	44	219	86
ALT\S (U/L)	30-50	47	1428	128	127	468	136
GGTΨ (U/L)	12-58	ND	ND	ND	36	191	60
PT \wedge (seconds)	12	13	ND	ND	ND	ND	ND
APTT\textcircled{a} (seconds)	32	36	ND	ND	ND	ND	ND

*Liver Function Tests (LFT); *Alkaline Phosphatase (ALP), #Aspartate Transaminase (AST), \S Alanine Transaminase (ALT), Ψ Gamma Glutamate Transpeptidase (GGT), \wedge Prothrombin Time (PT), \textcircled{a} Activated Partial Prothrombin Time (APTT), Not Done (ND)*

The 2008 attack (sixth episode) occurred during the course of our investigations. Physical examination revealed deep jaundice with pronounced scleral icterus, increased skin pigmentation and generalised excoriations secondary to severe pruritic itching. He had no signs of spider naevi, palmar erythema, thenar atrophy to suggest hepatocellular failure. Laboratory analysis showed elevated levels of bilirubin and transaminases (Table 1). Genetic

screening for *ATP8B1* and *ABCB11* did not reveal any mutations for PFIC1 or PFIC2 on the hot spots suggesting a mutation in other sites not screened. Hence, fulfilling the Tygstrup Diagnostic Criteria [13] based on the pathognomic clinical manifestations and biopsy results the patient was diagnosed and managed as a case of BRIC. Patient was commenced on a combination of Ursodeoxycholic acid (UDCA) and Rifampicin

that was well tolerated; after one month of treatment the laboratory results and clinical

examination of the patient showed marked improvement (Table 2).

Table 2: Depicting the Liver function Test parameters and the initiation, duration and response for treatment of the sixth episodic attack.

LFT	Weekly dates on which patient was initially commenced on treatment						
	Week 1 (4/4/08)	Week 2 (1/5/08)	Week 3 (7/5/08)	Week 4 (13/5/08)	Week 5 (21/5/08)	Week 6 (18/6/08)	Week 7 (15/7/08)
T/Protein (g/L)	80	ND	ND	79	76	74	74
Albumin (g/L)	39	35	35	36	39	40	42
AST (U/L)	86	41	ND	45	55	27	21
ALT (U/L)	136	39	31	41	39	19	20
ALP (U/L)	78	80	84	77	69	45	40
GGT (U/L)	60	ND	ND	49	64	32	20
T/Bil ($\mu\text{mol/L}$)	53	479	444	332	191	42	19
Conj/ Bil ($\mu\text{mol/L}$)	ND	ND	ND	308	ND	20	15

Liver Function Tests (LFT); Alkaline Phosphatase (ALP), Aspartate Transaminase (AST), Alanine Transaminase (ALT), Gamma Glutamate Transpeptidase (GGT), Total Bilirubin (T/Bil), Conjugated Bilirubin (Conj/Bil), Total Protein, Not Done (ND)

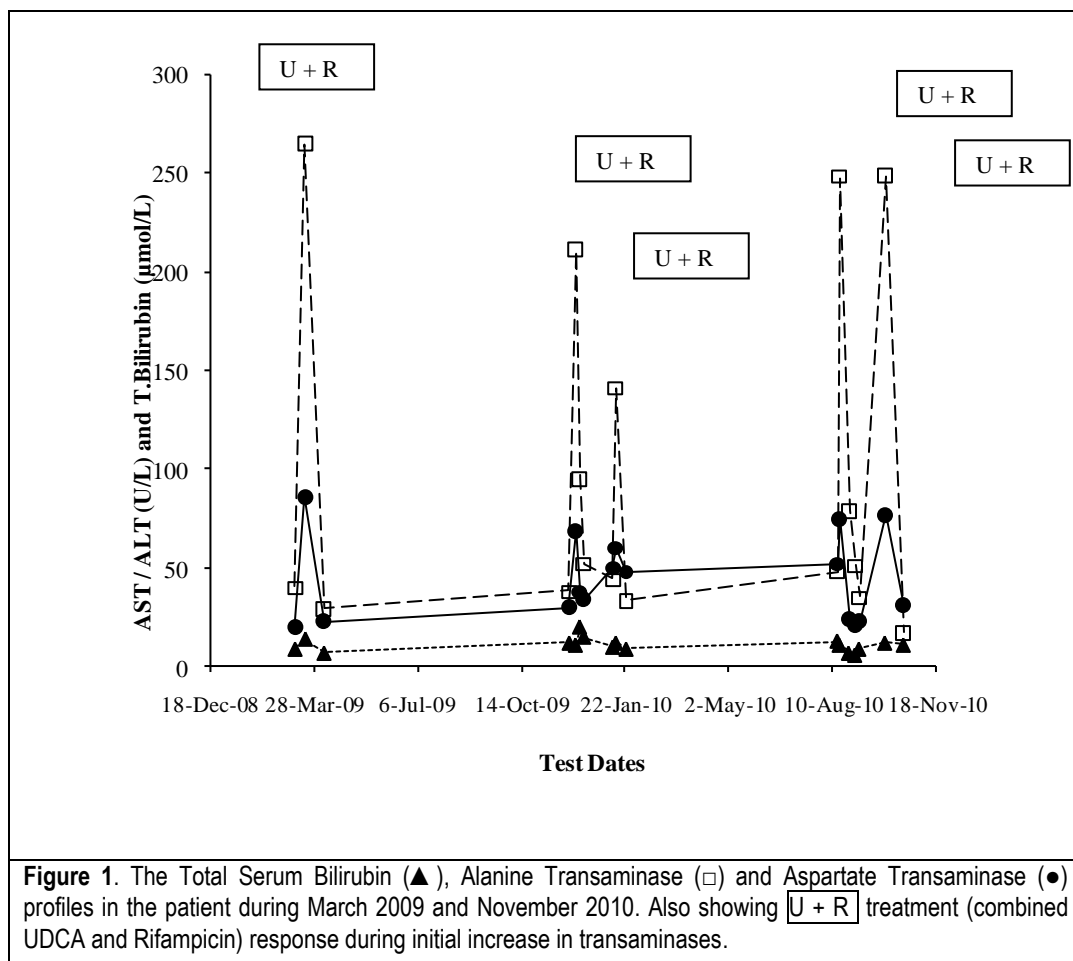


Figure 1. The Total Serum Bilirubin (\blacktriangle), Alanine Transaminase (\square) and Aspartate Transaminase (\bullet) profiles in the patient during March 2009 and November 2010. Also showing $\text{U} + \text{R}$ treatment (combined UDCA and Rifampicin) response during initial increase in transaminases.

During the subsequent two years (Nov, 2008 to Nov, 2010), the patient had five pre-icteric episodes. Upon the establishment of early symptoms of malaise, pruritus and associated elevated transaminases (particularly ALT), patient was consistently commenced on a two week course of UDCA and Rifampicin which effectively lowered the levels of transaminases and kept patient in remission (Figure 1). It has now been over ten years (2007 to 2018) since the management approach was established. Over the latter seven year period, he had only one course of the treatment.

DISCUSSION:

The management of BRIC is not definitive and has been generally to alleviate the debilitating effects of cholestasis. It includes treatment for pruritus relieve with bile acid sequestrants like cholestyramine, centrally acting opioid antagonists, antihistamines and/or rifampicin. It has also been managed with invasive procedures like nasobiliary drainage, extracorporeal albumen dialysis and occasionally liver transplantation [14]. Non-invasive preventative measures for cholestasis has never before been documented. Consistent with BRIC episodes, a pre-icteric phase associated with malaise, generalised pruritus and consisting of elevations in transaminases, particularly ALT and presumably serum total bile acids (not tested), always preceded hyperbilirubinaemia for this patient. As such, the early establishment of the pre-icteric phase

guided the prompt administration of an intervention strategy which prevented the development and progression to actual clinical and biochemical pathognomic features of BRIC (Figure 1). Unfortunately, during the treatment and monitoring periods, the precipitating factors could not be ascertained, however, it was noted that the symptoms started mainly in the rainy periods. As such, upon the earliest onset of symptoms and confirmation with spikes in the transaminases, treatment with UDCA and rifampicin were initiated and continued for a period of two weeks, effectively preventing progression to clinical BRIC on all occasions (Figure 1). UDCA is a steroid bile acid which is FDA approved for use in primary biliary cirrhosis (PBC) and other cholestatic disorders despite its mechanism of action not being elucidated [15]. Moreover, recent reports indicate that it is used in ATP8B1 and ABCB11 deficiencies (BRIC1 and BRIC2) but has not shown any consistent effects [16]. In contrast, Rifampicin, which indirectly increases the 6 α -hydroxylation of bile acids, that is subsequently glucuronidated and excreted in the urine reduces or abolish pruritus in mild forms of ATP8B1 and ABCB11 deficiency (BRIC1 and BRIC2) but not in severe forms (PFIC1 and PFIC2) [10]. The response to treatment thus, further confirms the BRIC diagnosis. The combination of these two medicines effectively prevents the progression of BRIC from the pre-icteric phase to the cholestatic episodes.

CONCLUSION:

Knowledge of BRIC is crucial as early recognition can avoid the performance of expensive and/or invasive diagnostic investigations and also the patient can be counselled regarding its benign nature. The effective preventative therapeutic approach used for this patient is a non-invasive method that can be utilised in BRIC cases. A pre-cholestatic treatment approach, which was of a short duration and effectively prevented cholestatic episodes on all occasions, was established. This approach seems to have prevented subsequent pre-cholestatic symptoms. As such, the anticipatory short course administration of UDCA and Rifampicin has proven to be successful, thus the administration will effectively limit, minimise or eliminate BRIC symptoms in patients on recurrent and prolonged medications during the long cholestatic bouts.

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REFERENCES:

1. De Koning, T.J., Sandkuijl, Lodewijk A, De Schryver, Jan EAR, Hennekam, Eric AM, Beemer, Frits A, Houwen and Roderick HJ, Autosomal-recessive inheritance of benign recurrent intrahepatic cholestasis.

- American Journal of Medical Genetics Part A, 1995. 57(3): p. 479-482.
2. Summerskill, W. and J. Walshe, Benign recurrent intrahepatic" obstructive" jaundice. The Lancet, 1959. 274(7105): p. 686-690.
3. Ermis, F., Oncu, Kemal, Ozel, Melih, Yazgan, Yusuf, Gurbuz, Ahmet Kemal, Demirturk, Levent, Demirci, Hakan, Akyol, Taner and Hahoglu, Aptullah, Benign recurrent intrahepatic cholestasis: late initial diagnosis in adulthood. Ann Hepatol, 2010. 9: p. 207-10.
4. Davit-Spraul, A., Gonzales, Emmanuel, Baussan, Christiane and Jacquemin, Emmanuel, Progressive familial intrahepatic cholestasis. Orphanet journal of rare diseases, 2009. 4(1): p. 1.
5. Selvan, S. and T. Pugazhendhi, Adult onset Benign Recurrent Intra Hepatic Cholestasis type 2-a case report. International Journal of Scientific Research, 2018. 6(5).
6. Putterman, C., and Keidar, S., Benign recurrent intrahepatic cholestasis. Harefuah, 1987. 113(3-4): p. 70.
7. Nakamuta, M., Sakamoto, S, Miyata, Y, Sato, M and Nawata, H, Benign recurrent intrahepatic cholestasis: a long-term follow-up. Hepato-gastroenterology, 1994. 41(3): p. 287-289.
8. Folvik, G., O. Hilde, and G.O. Helge, Benign recurrent intrahepatic cholestasis: review and long-term follow-up of five cases. Scandinavian journal of gastroenterology, 2012. 47(4): p. 482-488.
9. van Mil, S.W., van der Woerd, Wendy L., van der Brugge, Gerda, Sturm, Ekkehard, Jansen, Peter LM., Bull, Laura N., van den Berg, Inge ET., Berger, Ruud, Houwen, Roderick HJ. and Klomp, Leo WJ, Benign recurrent intrahepatic cholestasis type 2 is caused by mutations in ABCB11. Gastroenterology, 2004. 127(2): p. 379-384.
10. Marin, J.J. and R.H. Houwen, Treatment of paediatric cholestasis due to canalicular

- transport defects: yet another step forward. *Gut*, 2014: p. gutjnl-2014-307014.
11. Jacquemin, E., Progressive familial intrahepatic cholestasis. *Clinics and research in hepatology and gastroenterology*, 2012. 36: p. S26-S35.
 12. Tygstrup, N. and B. Jensen, Intermittent intrahepatic cholestasis of unknown etiology in five young males from the Faroe Islands. *Journal of Internal Medicine*, 1969. 185(1-6): p. 523-530.
 13. Tygstrup, N., Intermittent possibly familial intrahepaticcholestatic jaundice.*Lancet*, 1970. 1: p. 1171,812,.
 14. Kumar, P., Charaniya, Riyaz, Ahuja, Arvind, Mittal, Sakshi and Sahoo, Ratnakar, Benign recurrent intrahepatic cholestasis in a young adult. *Journal of clinical and diagnostic research: JCDR*, 2016. 10(6): p. OD01.
 15. Kottb, M.A., Molecular mechanisms of ursodeoxycholic acid toxicity & side effects: ursodeoxycholic acid freezes regeneration & induces hibernation mode. *International journal of molecular sciences*, 2012. 13(7): p. 8882-8914.
 16. Stapelbroek, J.M., van Erpecum, Karel J., Klomp, Leo WJ. and Houwen, Roderick HJ, Liver disease associated with canalicular transport defects: current and future therapies. *Journal of hepatology*, 2010. 52(2): p. 258-271.

**PREVALENCE OF *TRICHURIS TRICHIURA* AND *ASCARIS LUMBRICOIDES* INFECTION AMONG
ELEMENTARY SCHOOL CHILDREN AT POREBADA VILLAGE IN HIRI DISTRICT,
CENTRAL PROVINCE, PAPUA NEW GUINEA**

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ABSTRACT:

Trichuris trichiura that causes trichuriasis and *Ascaris lumbricoides* that causes ascariasis are highly prevalent among elementary school children in some developing countries. The aim of this study was to determine the prevalence of *Trichuris trichiura* and *Ascaris lumbricoides* among elementary school children at Porebada village, in Hiri district, Central province, Papua New Guinea. This was a prospective purposive cross sectional study. All the children were in the age group 7 to 11 years. Consent was obtained from only 58 (64.4%) of the 90 children in the school. Single stool sample was collected from each of the 58 children (40 males and 18 females). The stool samples were examined for *Trichuris trichiura* and *Ascaris lumbricoides* ova using the recommended direct saline method. A total of 79.3% (46/58) of the children (51.7% males and 27.6% females) were infected. Of the 46 children infected, double infection (*Trichuris trichiura* and *Ascaris lumbricoides*) was prevalent among 47.8% (22/46) of them and single infection (*Trichuris trichura* 2/46 and *Ascaris lumbricoides* 22/46) was prevalent among 52.2% (24/46). The high (79.3%) infection rate observed in the present study should be of concern to the health authorities because of the impact on the health of the school children and possible negative effect on their learning ability and concentration in school work.

Keywords: *Trichuris trichiura*, *Ascaris lumbricoides*, elementary school children

Submitted July, accepted October 2018

INTRODUCTION:

Roundworms infection particularly *Trichuris trichiura* that causes trichuriasis and *Ascaris lumbricoides* that causes ascariasis are distributed globally especially in the rural areas in some developing tropical and subtropical countries [1]. In 2010 the World Health

Organization (WHO) stated that approximately one billion humans have ascariasis, about 800 million have trichuriasis, and between 500 to 750 million have hookworm infections worldwide [1]. The effects of both *Trichuris trichiura* and *Ascaris lumbricoides* are often asymptomatic if the infestation is light.

However, heavy infection of *T. trichiura* has been implicated in rectal prolapse and chronic dysentery [2]. Heavy *A. lumbricoides* infection can also result in serious pathology due to migrations of the worms in the body [2, 3]. Both infections have an adverse effect on physical fitness, cognitive performance [4], nutritional status, growth as well as school attendance of school age children [4, 5, 6].

According to the WHO, improving the health and wellbeing of the population is a policy that all countries must implement. The Papua New Guinea (PNG) government accepted this and other health policies proposed by the WHO. Thus, in 2015 the government adopted and implemented the PNG Water, Sanitation and Hygiene (WaSH) Policy 2015 to 2030 [7]. The policy embodies the commitment of the PNG government to sustainably improve the health and wellbeing of the people especially women and children in the rural, urban and remote of the country. This policy focuses on improved service delivery of drinking water, sanitation and promoting long term hygiene behaviour change (collectively known as WaSH) in all the communities [7]. Improved access clean water, toilet facilities in schools and homes among others are essential for human development and therefore the sustainable development of the country. Successful implementation of this policy requires the availability of appropriate

data on the sanitation and hygiene practices among the various communities in PNG.

The study was prompted by the very scanty data on the prevalence of *A. lumbricoides* and *T. trichiura* infestations among elementary school children in PNG [8, 9]. There are no published data on the prevalence of *A. lumbricoides* and *T. trichiura* infestations among elementary school children in the Hiri district in the Central Province in PNG.

The aim of this study was to determine the prevalence of *Trichuris trichiura* and *Ascaris lumbricoides* among elementary school children in the Porebada village, in Hiri district, Central province, PNG.

METHODOLOGY:

This was a prospective purposive cross sectional study carried out between August 2016 and October 2016. The study population consisted of elementary school children attending Porebada Community School at Porebada village, Hiri district in Central province in PNG. This is the main elementary school in Porebada village. Defecation by the community is in the open fields, bushes, drains and pit latrines. At the school there is one toilet building divided for both gender and shared by all the school children in the Porebada Community School.

Ethical clearance and permission for this project was obtained from the ethical and

research grant committee in the School of Medicine and Health Science (SMHS), University of Papua New Guinea (UPNG) and from the authorities in the Porebada Community School.

All the 90 children attending the school were selected to participate in the study. After obtaining informed and written consent from the parents or guardians, clean wide mouth plastic vial with lid was given to each of the children whose parents gave consent. Standard procedure for sample collection and precautions were explained clearly and thoroughly to the children and their parents and guardians individually. A structured pre-tested questionnaire was used to obtain information on the socio-economic status, living environment, demographic data, sanitary facilities, worm treatments and behavioural habits like washing hands before meals, drinking boiled water and use of foot-ware.

The faecal samples of the consented children were collected and transported to the laboratory for analysis by a qualified medical microbiologist in the Medical Laboratory Sciences discipline department of Health Sciences in the SMHS UPNG. Each faecal sample was examined for *T. trichiura* and *A. lumbricoides* ova using the WHO approved protocol [3]. Each faecal sample was also examined macroscopically for texture and colour. For microscopy, approximately 2 grams of stool was added into 10 ml of saline solution,

and then mixed using vortex mixture. Two drops of the mixture was placed on the clean glass slide, cover slip applied and examined for ova and results recorded [3]. The results obtained were analysed using Epi Info 7 and Microsoft Excel Data pack 2010.

RESULTS:

Consent was obtained from 58 (64.4%) of the 90 children selected to participate in this study. Gender distribution of the 58 children showed that 69.0% (40/58) were males and 31.0% (18/58) were females.

Of the 58 children that participated in the study 46 (79.3%) were infected with either *T. trichiura* causing trichuriasis or *A. lumbricoides* causing ascariasis or both (double infection). The single infection by *T. trichiura* was prevalent among 4.3% (2/46) of the children compared to single infection by *A. lumbricoides* that was prevalent among 47.8% (22/46) of the children. The double infection by *T. trichiura* and *A. lumbricoides* was prevalent among 47.8% (22/46) of the children. Table 1 shows gender distribution of the prevalence of single and double infections among the 46 infected children.

The highest infection rate (91.3%) was among children in the 7 to 9 years age group compared to 8.7% among children in the 10 to 11 years age group (Table 2). Analysis of the questionnaires indicated that of the 58 children

49 (84.5%) had toilets in their homes; 54 (93.1%) got water for drinking from water taps while 4 (6.9%) got water for drinking from tanks and drums.

The children were asked if they have experience symptoms such as diarrhoea, abdominal pain, nausea and vomiting, weakness and diarrhoea with blood. Of the 58 children 51 (87.9%) responded that they have experienced at least one or more of those symptoms, while 7 (12.1%) said they had never

experience any of the symptoms. Answers to questions on hand washing before eating, use of toilet and foot-ware are presented in Table 3. Most of the children (62.1%) sometimes wash their hands before eating, 37.9% sometimes use toilets and 24.1% never use the toilet because they only use the open field. Foot ware was not used at school by 17.2% (10/58) of the children and 72.4% (42/58) only sometimes wear foot ware at school.

Table 1: Gender distribution of the prevalence of single and double infections among the 46 infected children.

	N	Single infection		Double infection
		<i>Trichuris trichiura</i>	<i>Ascaris lumbricoides</i>	<i>T. trichiura</i> & <i>A. lumbricoides</i>
Male children	30	2 (6.7%)	14 (46.7%)	14 (46.7%)
Female children	16	0	8 (50.0%)	8 (50.0%)
Total	46	2 (4.3%)	22 (47.8%)	22 (47.8%)

Table 2: Prevalence (%) of infection among the 46 children in the 7 to 11 years age group

Age (years)	7	8	9	10	11
Number (%) of children	13 (28.3%)	15 (32.6%)	14 (30.4%)	3 (6.5%)	1 (2.2%)

Table 3: Answers to questions on attitude and practice by the 58 children that participated in this study

Questions	Always	Sometimes	Never
Wash hands before eating?	22 (37.9%)	36 (62.1%)	0
Wash hands with soap and water?	10 (17.2%)	48 (82.8%)	0
How often do you use the toilet?	22 (37.9%)	22 (37.9%)	14 (24.1%)
Wearing footwear to school	6 (10.3%)	42 (72.4%)	10 (17.2%)

DISCUSSION:

A. lumbricoides and *T. trichiura* infections in elementary school children are reported for the first time in this area. In this prospective study, the results show that majority (79.3%) of the children had either single or double infection. Among the two single infections, ascariasis infection was higher (47.8%). The higher number of *A. lumbricoides* in this study was similar to that reported by Leykun [10] in Northwest Ethiopia. In addition 47.8% of the children in our present study had both trichuriasis and ascariasis infections (double-infection) which is also similar to the results obtained by others [10, 11]. It is not surprising to see the double infection in children because the two species have similar mode of transmission and life cycle [2].

A. lumbricoides was more prevalent among the male children. Similar findings have been reported among children in other elementary schools in the Central Province in PNG [9]. In another study the authors reported that *T. trichiura* infection was common among school children, with higher proportion amongst the male than female children [9]. The differences in the prevalence among the gender appear to be associated with environmental sanitation, water supply, individual habits and socioeconomic status of the households,

although this needs to be verified in more extensive follow up studies.

The high infection rate among children in the 7 to 8 years old age group indicates that the young children are the high risk groups in the community and serves as one of the sources of infection and transmission. Helminths such as *A. lumbricoides* and *T. trichiura* can also impair the mental and physical development of children [4]. If left untreated they can affect the lungs, heart and liver as well as other body tissues [1,2,13]. These infections can cause anaemia when haemoglobin levels decrease as a result of malabsorption of nutrients and bleeding in the gastrointestinal tract in general [6]. These conditions can affect the learning ability of young children in school.

This should be of great concern to the health authorities in the community, the district and province. It is therefore important to develop appropriate public health strategies to ensure that young children are free from trichuriasis and ascariasis infections. The authorities should provide safe and adequate water supply, proper toilets for the schools and homes, reduce defecation in the open fields or bushes, carryout intensive advocacy and health education aimed at bringing behavioural changes in the community. In addition, periodic de-worming should be carried out among

young children to eradicate trichuriasis and ascariasis infections.

The answers of the participants to questionnaires indicate that washing hands with soap before eating, using proper foot ware and using proper toilets were not very common practices in the community. Tilahu et al [5] reported that the habits of children not wearing shoes to school and not washing hands before eating are associated with increased number of soil transmitted helminths infection. The authors also reported that transmission of both of these species was due to ingestion or penetration of infective eggs. The result in the present study highlights the need for intensive education and awareness campaign to improve sanitation and promoting long term hygiene behaviour change in the community. This can be achieved by effective implementation of the PNG WaSH policy [7].

The Policy aims to reverse the prevailing unhealthy practices and improve water, sanitation and hygiene service delivery for the benefit of the people and in doing so improve personal health, productivity and well-being. Access to these services is a vital component of sustainable development and the alleviation of poverty in the community [7].

CONCLUSION:

A total of 79.3% (46/58) of the children (51.7% male and 27.6% female) attending the Porebada elementary school that participated

in this study had either single or double infection of the species *A. lumbricoides* and *T. trichiura*. The highest infection rate (91.3%) was among children in the 7 to 9 years age group compared to 8.7% among children in the 10 to 11 years age group. Of the 58 children 49 (84.5%) had toilets in their homes; 62.1% sometimes wash their hands before eating, 37.9% sometimes use toilets and 24.1% never use the toilet because they defecate in the open field. The result highlights the need for intensive education and awareness campaign to improve sanitation and promoting long term hygiene behaviour change in the community. This can be achieved by effective implementation of the PNG WaSH policy.

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REFERENCES:

1. Helminth control in School age children, A guide for managers for control programmes, WHO 2nd edition, 2010.
2. Chiodoni PL, Moody AH and Manser DW. Atlas of Helminthology and Protozoology, Fourth edition, Churchill livingstone, London, United Kingdom, 2003, page 6-7.

3. World Health Organization, Basic Laboratory Methods in Medical Parasitology, WHO, Geneva, Switzerland, 1991.
4. Drake LJ, Jukes MCH, Sternberg RJ and Bundy DAP. Geohelminth Infections (Ascariasis, Trichuriasis, and Hookworm): Cognitive and Developmental Impacts. Seminars in Pediatric Infectious Diseases. 2000; 11: 245–251.
5. Tilahun Aleign, Degarege Abraham and Erko Berhanu. Soil-Transmitted Helminth Infections and Associated Risk Factors among Schoolchildren in Durbete Town, North western Ethiopia, J of Parasitology Research, Vol 2015, page 1-5.
6. Taylor-Robinson DC, Maayan N, Soares-Weiser K, Donegan S and Garner P. Deworming drugs for soil-transmitted intestinal worms in children: effects on nutritional indicators, haemoglobin and school performance. Cochrane Database System Rev, 2012; 7: CD000371.
7. PNG National Water, Sanitation and Hygiene (WaSH) Policy 2015 to 2030. Department of National Planning and Monitoring, www.planning.gov.pg/images/dnpm/pdf/WaSH_POLICY04.03.2015.pdf
8. Abala D and Pusahai-Riman P. Prevalence of *Ascaris lumbricoides* infection in elementary students in Ameika village, North Mekeo in Central Province, Papua New Guinea, Research project, Discipline of Medical Laboratory Science, Division of Health Science, School of Medicine and Health Science, University of Papua New Guinea, Papua New Guinea. 2013, (Unpublished)
9. Bala P and Pusahai-Riman P. Trichuriasis infection in elementary students at Galoma village, Rigo District in Central Province, Research project, Discipline of Medical Laboratory Science, Division of Health Science, School of Medicine and Health Science, University of Papua New Guinea, Papua New Guinea, 2012, (Unpublished)
10. Leykun Jemaneh. Soil-Transmitted Helminth Infections and Schistosomiasis mansoni in School Children from Chilga District, Northwest Ethiopia; Ethiopia Journal of Health Science, 2001, Volume 11; Number 2: page 79-87
11. Raj Mahendra S, Sein KT, Anuar Khairul A and Mustafa BE. Effect of intestinal helminthiasis on school attendance by early primary school children, Transactions of the Royal Society of Tropical Medicine and Hygiene, 1997, volume 91, number 2, pp. 131–132.
12. Harhay Michael O, Horton John and Olliaro Piero L. Epidemiology and control of human gastrointestinal parasites in children, Expert Review of Anti-infective Therapy. 2010, 8; (2): 219–34.
13. World Health Organization, Eliminating Soil-Transmitted Helminthiasis As a Public Health Problem in Children. Progress Report 2001–2010 and Strategic Plan 2011–2020, World Health Organization (WHO), Geneva, Switzerland, 2012.

**DETERMINANTS OF SUICIDE IN PACIFIC REGION AND NEEDS FOR CONSIDERING EQUALITY
AMONGST PACIFIC PEOPLE: A SYSTEMATIC REVIEW**

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Running Title: Determinants of suicide in Pacific region

ABSTRACT:

Globally, the World Health Organization (WHO) estimates that at least 800,000 individuals lose their lives each year, as a result of suicide. Due to lack of previous studies in the Pacific region, this systematic review is written to identify the available literature on suicide in the Pacific region and its respective prevalence and determinants. Furthermore, this study set out to investigate any evident inequalities present within the Pacific regarding suicide. This systematic review study applied Cochrane Library Guidelines to search, review, appraise, and analyse articles related to suicide. Both qualitative and quantitative articles published between 2000 and 2017 in English language and published in databases such as Medline, Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsychInfo, ExcerptaMedicaDataBASE (EMBASE), Scopus, and Web of Science were selected. Medical subheadings (MeSH) and keywords were utilised to achieve the relevant articles. A data extraction sheet was created, and descriptive statistics applied to analyse the data. A total of 24 peer reviewed research papers were included. Majority of studies were conducted in New Zealand (29.15%) and only one of these studies was applied as a randomized controlled trial. Questionnaires were the most frequently used data collection tool. There were five largely evident determinants of suicide factors - culture and ethnicity (15 studies), religion (9 studies), marital issues (10 studies), gender (11 studies) and mental health (12 studies). The results of this study highlighted the main determinates which affect equality among Pacific people regarding to Suicide. They are reason enough for further research as they can allow medical professionals to design preventative measures for these groups who can be considered high risk.

Keywords: Prevalence, Determinants, equality, suicide, Pacific

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INTRODUCTION:

Over the years the issue of suicide has become more and more alarming in modern day society. Suicide is defined as the act or instance of taking one's own life voluntarily or intentionally [1]. This is done through various methods which can include self-mutilation, poisoning, asphyxiation, drug overdose, hanging and burning [2]. Moreover, with programs such as the World Health Organization (WHO) Suicide Trends in At Risk Territories (START) initiative, more light is now being shed on the issue at hand [3].

Globally the WHO estimates that at least 800,000 individuals each year lose their lives as a result of suicide [4]. Additionally, it was found that in 2015, suicide was responsible for 1.4 percent of all deaths worldwide making it the seventeenth leading cause of death in the same year [5]. Despite this, researchers believe that for every suicide related death at least 20 unrecorded suicide attempts were recorded. Most alarming is the fact that 78% of the total recorded suicides were reported from low to middle income countries.

Currently the global suicide trend is set at one death every forty seconds, however it is estimated that by the year 2020 the rate will increase to one death every 20 seconds [6]. This correlates to an estimated average of 10.7 suicide deaths per 100,000 population deaths.

Hence suicide is an issue that is of grave concern and needs to be addressed [7].

In light of the alarming global statistics a key demographic that needs to be monitored in terms of suicide is that of the Pacific Islands; as in a comparative study carried out by the Australian National University (ANU) it was found that Pacific Island countries had some of the highest rates of suicide when compared to western countries [8]. Other key findings of this study included that females made up the majority of the reported cases in island countries such as Fiji and Samoa [9]. Further evidence of this was found in a study published by the New Zealand Medical Journal which reported that youths in Pacific region were three times more likely than European youths to commit suicide [10].

Furthermore, methods such as hanging, and pesticide poisoning were found to be common in the Pacific islands [11]. In studies setting out to investigate the use of the pesticide paraquat as a poison, it was found that large nations such as South Korea have put in place policies which make paraquat harder to obtain [12].

Another research was carried out in Western Samoa and resulted in a slight decline in the suicide rate. However, a study by Laura Wyatt set out to determine the key determinants of suicide in the Pacific and one major determinant found was depression [13]. The article went on to explain that 11% of Pacific

youths experience some form of depression by the age of 18[13]. This was due to various factors such as bullying, physical abuse and neglect among youths. Hence this indicates proves that suicide is a matter of grave concern within the Pacific.

Hence with the high rates in the Pacific there is currently a need for more research on the topic of suicide in this region. This systematic review is written to identify the available literature on suicide and shed some light into the prevalence and determinants in the Pacific region. Furthermore, this study set out to review any evident inequalities present within the Pacific regarding suicide.

METHODOLOGY:

The systematic review was conducted using the Cochrane Library Guidelines. The following databases were used to obtain relevant articles: Medline, CINAHL, Psych Info, EMBASE, Scopus, and Web of Science. The databases used were common among studies involving violence, which is why they were selected. Medical subheadings (MeSH) and keywords were used to achieve the relevant articles which included, violence*, prevalence, determinants and Pacific. To further the search

for articles, AND & OR were used to combine the search parameters. The articles included in this study were from the January 2000 to July 2017, in the English language; peer reviewed and had full text accessible.

To protect the study from selection bias, two independent reviewers scanned the titles of all available studies and removed the irrelevant studies. The reviewers then read the abstracts of the remaining studies, again removing the irrelevant studies. The third step conducted by the reviewers was reading of the full texts in order to obtain the final articles. Twenty-one studies met the study inclusion criteria [14,15] (Figure 1).

Once this was done, the reviewers searched the bibliographies of the selected studies in order to find more relevant articles. Following this, three more articles were accepted bringing the total to twenty-four. The studies full texts were then printed for further analysis. Using the information from the selected studies, an extraction sheet (Annex 1) was developed with four sections, which were: study information, population, methodology and results.

A descriptive analysis was then carried out and frequencies and percentages were recorded.

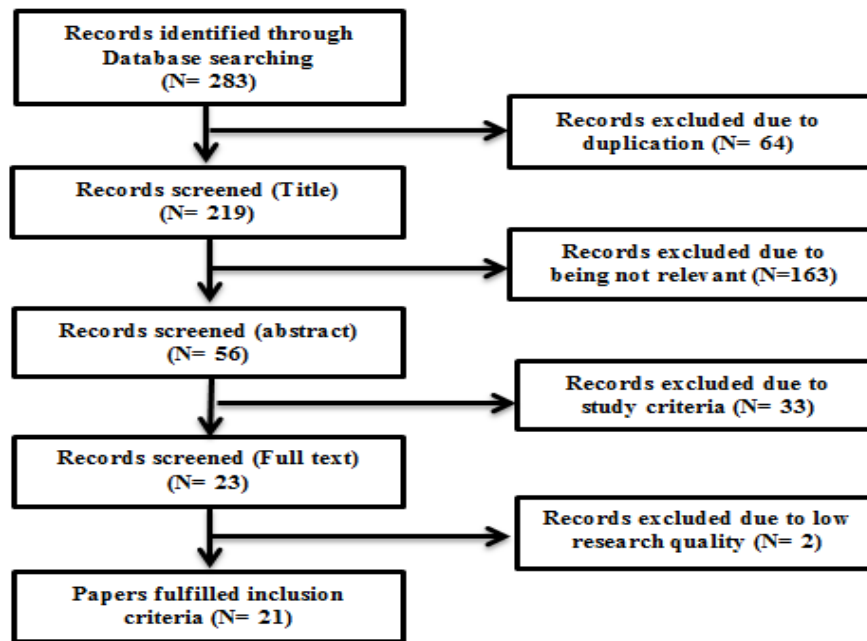


Figure 1: Article selection process

FINDINGS:

A total of 24 studies were selected. Of these 7 (29.2%) were conducted in New Zealand, 6 (25.0%) in Fiji and also in the US and 5 (20.8%) in other Pacific countries. The results also showed that 10 (41.7%) studies were conducted between 2011 to 2017 and 14 (58.3%) studies were between 2000 and 2010. For the study settings, 11 (45.8%) were community based, 7 (29.2%) were school-based and 6 (25.0%) were hospital-based studies

The pool number of participants within the 24 studies was 271785. Majority of the studies were cross sectional (83.3%), 2 (8.3%) was

qualitative and only one (4.2%) was randomized controlled trial. Purposive sampling was applied for 20 (83.3%) studies random sampling for 3 (12.5%) and one convenience sampling. For data collection methods, questionnaires were used in 12 (50.0%), Case reports in 10 (41.7%) and 2 (8.3%) used focus group discussion to collect the data.

The number and percentage of the various studies indicated the determinants of suicide factors are shown in Table 1 such as culture and ethnicity 15 (62.5%) studies, religion 9 (37.5%) studies, marital issues 10 (41.7%) studies, gender 11 (45.8%) studies and mental health 12 (50.0%) studies.

There are some other factors that are reported as determinants of suicide among Pacific people. They include unemployment, age, and substance abuse, lack of supportive

environment, social status, experienced violence, and education status, family problems, and parenting, peer pressure, and family history of suicide.

Table 1: More frequent and less frequent determinants of suicide

More frequent determinants of suicide	
Determinant	Frequency
Culture and ethnicity	15 (62.5%)
Religion	9 (37.5%)
Marital Status/Problems	10 (41.7%)
Gender	11 (45.8%)
Mental Health	12 (50.0%)
Less frequent determinants of suicide	
Social status	5 (20.8%)
Unemployment	7(30.0%)
Peer Pressure	2(10.0%)
Experienced violence	5 (20.8%)
Family history of suicide	2 (10.0%)
Education	5 (20.8%)
Family problems	4 (16.0%)
Age	7(30.0%)
Substance abuse	7(30.0%)
Parenting	2(10.0%)
Lack of supportive environment	6 (25.0%)

NB: Results for percentages are cumulative, thus do not add up to 100

DISCUSSION:

This study set out to identify the evident determinants of suicide in the Pacific based on the data published in 24 different studies from 2000 to 2017. A total of 16 factors considered as determinants of suicide were identified. Out of the 16 there appear to be five (31.3%) largely evident factors. These 5 factors are culture and ethnicity, religion, marital issues, gender and mental health.

The first major factor or determinant of suicide is that of culture and ethnicity. Within the Pacific, culture is something that all of the various nations hold dear and is revered throughout the region. In a study conducted by Thomas McDade on the effects of cultural status among Samoan adolescents, it was found that cultural status had a biological impact on the youths and affected their stress levels directly [16]. This stress or drive can

have detrimental impacts on the adolescents causing mental strain and even suicide ideation. Additionally, mental illness is looked down upon in certain cultures to the point where issues such as depression are often ignored [17]. This neglect and sense of abandonment can be a stepping stone for suicide ideation and in the long run lead to the act itself. Hence the culture of Pacific Islanders needs to be considered when looking at the issue of suicide.

The review also suggests that religion is an important determinant of suicide. Despite being observed in multiple studies, religion also appeared to be considered as a protective factor against suicide [18]. This is further backed in a report published by De Leo which stated that integrated methods need to be used when approaching the issue of suicide involving factors such as race and religion [19]. Additionally, in a study by Lizardi it was stated that by identifying an individual's religion the suicide risk of that individual can be obtained [18]. This as explained by the article would be done by assessing the religions stance on suicide. For example, Christianity, Islam and Hinduism do not condone suicide. Therefore, religion as implied in the mentioned studies can be a useful tool if integrated into suicide prevention strategies [20].

Another determinant identified within this study which appeared to be evident was that of marital status and marital issues. Marital issues and disagreements can have very scaring and

strenuous impacts on an individual's mental state. In a study conducted among the people of Tokelau it was found that marital and relationship issues were two of several factors that can lead to suicide [21]. A similar study conducted to assess the impacts of divorce among individuals varying in age gender and ethnicity demographics found that the divorced groups were more vulnerable to suicide [22]. Due to the culture of the Pacific Islands, marital problems are issues that are not often openly discussed. Accompanied by stress and other concerns for image and wellbeing, marital problems can be disastrous for both individuals in the relationship if not taken seriously. Hence the need to include marriage counselling or relationship advice sessions is paramount in suicide prevention strategies for those that fall within the divorced groups.

The next determinant that was evident in this review was that of gender. Although ratios vary depending on the location, target population and age range, it is evident that there are noticeable differences in gender-based suicide rates. In a study conducted by Peeter Varnik who set out to analyse the WHO mortality statistics it was found that males had a higher suicide rate than females globally [23]. This according to Valerie Callanan was due to the lethality of suicide methods used by males when compared to those of females [24]. According to the Callanan's study it found that unmarried men were more likely to hang themselves than unmarried women. However,

these studies do not highlight, if any, the differences due to attempted suicides as they only focus on successful suicides. Hence further research into gender disparities relating to suicide need to be carried out.

The next factor that was determined by this systematic review was that of mental illness. According to a study by Bostwick it was estimated that the lifetime risk of suicide due to mental illness was 15%, however after conducting a meta-analysis based on that figure, Bostwick concluded that the risk of suicide for patients with affective disorders was only 4% [25]. A similar study conducted in New Zealand found that Pacific Islanders accounted for a high number of mentally ill comparing to other factors. The study however then went on to include that the islander who was born in their home country had a lower prevalence of mental disorders [26]. Despite this, it is common in the Pacific for mental illnesses to be stigmatized and in some cases be ignored, for example depression. According to Jennifer Ritsher, stigmatization of mental illness can lead to social withdrawal, perceived discrimination and negatively affect recovery orientation [27]. This in the long run can lead to suicide ideation and further down the road suicide itself. Hence the issue of mental health needs further consideration with regards to suicide.

Additionally, our study identified various other determinants of suicide which included physical violence, substance abuse, unemployment,

social status, family history of suicide, family problems, peer pressure, age, education status, experienced violence, parenting, and lack of supportive environment. These show that the issue of suicide is very complex and requires much more consideration before the issue can be tackled or preventative measures decided upon.

Despite the lack of studies based solely on inequalities in the Pacific, minor inequalities were evident in the results of this review. The first inequality evident is that of socioeconomic status and its role in making inequality among people to receive health services. In a study conducted in Scotland lower socioeconomic status was linked directly to a higher risk of suicide [28]. These inequalities were also linked to employment, education and income with all those in the lower socioeconomic status lower socio-economic classes having higher risk of suicide.

The next inequality that was evident through this study was that of gender differences in suicide rates. Globally men have higher rates of successful suicides when compared to females [23]. According to a study by Anne Maria Möller-Leimkühler it was found that this may be due to social change, societal issues, redefinition of the male gender role and different societal conditions [29]. These inequalities are reason enough for further research as they can allow medical professionals to design preventative measures

for these groups who can be considered high risk.

CONCLUSION:

This review set out to investigate the determinants and inequalities surrounding suicide in the Pacific and it suggests that culture and ethnicity remains as the main contributing factor for suicide. This review also raises an important question about religion as a second most important contributing factor for

suicide among the Pacific population. Though not all suicides are preventable but wide-ranging risk assessment approach may help the health service providers to provide support to those who are at risk of committing suicide and also it is not clear from the studies that who committed suicide whether they took professional mental health services. Further research is needed to detect who are at risks and community awareness regarding this issue should be raised.

Annex 1: Data Extraction Sheet

Article	Participants	Methods	Results
H.S. Aghanwa [30] Year: 2000 Country: Fiji Type of Study: Comparative	Number: 39 Age: 16-25 Male: 15 Female: 24	Sampling: Purposive Data Collection: Interviews, Case reports Place: Colonial War Memorial Hospital	Prevalence: 34.8 cases per 100,000 Determinants: Age, Ethnicity, Gender, Marital Status, Religion
Henry. S. Aghanwa [31] Year: 2001 Country: Fiji Type of Study: Cohort	Number: 58 Age: N/A Male: 16 Female: 42	Sampling: Purposive Data Collection: Patient Register Place: Colonial War Memorial Hospital Fiji	Prevalence: An estimated 25.9 self-poisoning cases per 100,000 population Determinants: Gender, Ethnicity, Religion, Marital Status, Employment Suicide Methods: Poisoning, Drug overdose
Henry Aghanwa [32] Year: 2004 Country: Fiji Type of Study: Comparative	Number: 128 Age: Mean (Male: 25.15) (Female: 22.99) Male: 40 Female: 88	Sampling: Purposive Data Collection: Patient Registry Place: Community	Prevalence Females (88) committed more suicide attempts than males (40) Determinants: Occupation, Marital Status, Religion, Ethnicity, Alcohol, Societal issues
Stéphane Amadéo [33] Year: 2015 Country: French Polynesia Type of Study: Randomized Control Trial	Number: 200 Age: N/A Male: 67; Female: 112 10 unaccounted for in article	Sampling: Purposive Data Collection: Interviews and START patient Registry Place: Community	Determinants: Gender, Marital Status, Employment, Psychiatric Disorder
Shane Shucheng Wong et al. [34] Year: 2012 Country: America Type of Study: Comparative	Number: 88,532 Age: 9th grade to 12th grade Male: 43,366 Female: 44,833	Sampling: Purposive/ Cluster Data Collection: Questionnaires Place: School	Determinants: Age, Ethnicity 1 in 6 suicides for Pacific islanders in America
Peter. M. Foster et al., [35] Year: 2012 Country: Fiji Type of Study: Descriptive	Number: N/A Age: N/A Male: N/A Female: N/A	Sampling: Purposive Data Collection: Police Reports Place: Community	Prevalence: 15 per 100,000 (Males) and 11 (Females) Determinants: Ethnicity, Marital Status, Education
Marco Innamorati [36] Year: 2011 Country: Type Study: Cross sectional	Number: 32,160 Age: 12-15 Male: N/A Female: N/A	Sampling: Purposive Data Collection: Survey Place: School	Determinant: Smoking linked to higher suicide ideation

Thomas K. Pinhey[37] Year: 2004 Country: Guam Type of Study: Descriptive	Number: 1,381 Age: N/A Male: 674 Female: 707	Sampling: Purposive Data Collection: Surveys Place: School	Determinants: Sexual Orientation
Graham Roberts [38] Year:2007 Country: Fiji Type of Study: Descriptive	Number: 132 Age: 10-75 Male: 45 Female: 87	Sampling: Purposive Data Collection: Case Reports Place: Hospital	Determinants: Gender, Religion, Ethnicity, Education Level, Marital Status, Age, Stress, Abuse, Mental Illness Prevalence: 90% of attempted suicide cases were indo Fijian, 66% were female
Priyata Thapa [39] Year: 2015 Country: US Type of Study: Descriptive	Number: 174 Age: about 20 Male: 56 Female: 118	Sampling: Purposive Data Collection: Self Recorded questionnaires Place: Community	Determinants: Knowledge, Age, Religion, Education, Mental Health
Annette L. Beautrais [40] Year: 2001 Country: New Zealand Type of Study: Descriptive	Number: 61 Age: 15 Male: N/A Female: N/A	Sampling: Purposive Data Collection: Case Reports Place: Community/Hospital	Determinants: Ethnicity, Family Disputes Method of Suicide Hanging, Poison, Firearms
Y. Joel Wong[41] Year: 2017 Country: US Type of Study: Descriptive	Number: 92,754 Age: N/A Male: N/A Female: N/A	Sampling: Purposive Data Collection: Case Reports/National Violent Death Reporting System Place: Community	Determinants: Mental Health, Socioeconomic status, partner problems, Suicide ideation
Karl Peltzer [42] Year: 2017 Country: Four Oceania Countries Type of Study: secondary analysis	Number: 6540 Age: 13 -16 Male: 2846 Female: 3534	Sampling: Systematic Data Collection: Survey Place: School	Determinants: Alcohol Use, Cannabis, Psychological Distress, Bullied, Physical Fighting
Song Chan[43] Year: 2001 Country: New Zealand Type of Study: Survey	Number: 8500 Age: N/A Male: 3874 Female: 4623	Sampling: Randomized Data Collection: Questionnaires, Survey Place: Community	Determinants: Age, Gender, Ethnicity, Socioeconomic status, Emotional state Prevalence 4.5% of the total population had attempted suicide at least once 7.9% had self-injured
C. June Strickland [44] Year: 2006 Country: US Type of Study: qualitative and quantitative	Number: 40 Age: N/A Male: N/A Female: N/A	Sampling: Purposive Data Collection: Focus Groups Place: Community	Determinants: Violence, Family Problems
JemaimaTiatia-Seath [45] Year: 2014 Country: New Zealand Type of Study: Qualitative	Number: 22 Age: 18+ Male:13 Female: 9	Sampling: purposive Data Collection: interview Place: community/Hospital	Determinants: Cultural views of mental illness
Theresa M. Fleming [46] Year: 2006 Country: New Zealand Type of Study: Descriptive	Number: 9570 Age: 9-13 Male: N/A Female: N/A	Sampling: Purposive Data Collection: Survey Place: School	Determinants: Parenting, Family support, School Staff, Supportive School Environment, Neighbourhood, Religion
Annette L. Beautrais [47] Year: 2006 Country: New Zealand Type of Study: descriptive study	Number: 12 992 Age: 16 years and over Male: N/A Female: N/A	Sampling: Purposive Data Collection: Survey Place: Community	Determinants: Sex, Age, ethnicity, education, Anxiety disorders, Mood Disorders, Substance abuse, eating disorders Suicide ideation Evident among 15% of study population
Iwalani R. N. Else[48] Year: 2007 Country: United States Type of Study: Descriptive	Number: N/A Age: N/A Male: N/A Female: N/A	Sampling: purposive Data Collection: Surveys Place: Community	Determinants: Ethnicity, gender, education, Sexual attitudes, Coping skills, family relations, parenting
Henry Aghanwa [32] Year: 2004 Country: Fiji	Number: 128 Age: N/A Male: 40	Sampling: convenience Data Collection: Suicide cases Place: Community/Hospital	Determinants Ethnicity, Religion, Occupation, Marital Status

Type of Study: Descriptive	Female: 88		Suicide Methods: Violent, Herbicide, Drug overdose Prevalence: Suicide was higher among females
Siale A[49] Year: 2006 Country: New Zealand Type of Study: descriptive	Number: 12 992 Age: 16> Male: 6756 Female: 6236	Sampling: purposive Data Collection: survey Place: community	Determinants: Anxiety disorders, Mood disorders, Substance use disorders, Eating disorders Prevalence: Lifetime prevalence of 16.5%
Hilario B. Fontecilla [50] Year: 2012 Country: Type of Study:	Number: 210 countries Age: N/A Male: N/A Female: N/A	Sampling: Purposive Data Collection: World Bank's official website and WHO's mortality database Place:	Determinants: There is a negative correlation between high income and developing countries , e.g. Canada, Australia and New Zealand
Tasileta Teevale [10] Year: 2016 Country: New Zealand Type of Study: Descriptive	Number: 1,445 Age: 12-19 Male: 592 Female: 797	Sampling: random Data Collection: survey Place: school	Prevalence high incidence of self-harm among participants (27.3%) High suicide ideation (23.3%), 11.6% had previous suicide attempts Determinants: Cultural, religion, Family issues, peer issues, life satisfaction, health seeking behaviours, family history of suicide
Iwalani R.N. Else[51] Year: 2009 Country: United States Type of Study: descriptive	Number: 881 Age: 10-14 Male: 351 Female: 530	Sampling: Purposive Data Collection: survey Place: school	Suicide indicators: Isolation, Social status, peer pressure, physical violence, sexual coercion

REFERENCES:

- Kidd, S.A., The need for improved operational definition of suicide attempts: Illustrations from the case of street youth. *Death Studies*, 2003. 27(5): p. 449-455.
- Stack, S., *Methods of Suicide around the World. Suicide as a Dramatic Performance*, 2015: p. 243-255.
- De Leo, D., Fleischmann A, Bertolote J, Collings S, Amadeo S, Chan S, Yip PS, Huang Y, Sanial B, Lilo F, Lilo C, David AM, Benavente B, Nadera D, Pompili M, Kolves KE, Kolves K, Wang X., The WHO START study: Suicidal behaviors across different areas of the world. *Crisis: The Journal of Crisis Intervention and Suicide Prevention*, 2013. 34(3): p. 156.
- W.H.O., *Suicide fact sheet. Secondary Suicide fact sheet*, 2016.
- Kaslow, N.J., Jacobs, Carl H., Young, Sharon L., Cook S., *Suicidal behavior among low-income African American women: A comparison of first-time and repeat suicide attempters. Journal of black psychology*, 2006. 32(3): p. 349-365.
- Tingle, J., *Preventing suicides: developing a strategy. British journal of nursing*, 2015. 24(11): p. 592-593.
- Karch, D., Crosby, A., Simon, T., *Toxicology testing and results for suicide victims-13 states, 2004. JAMA*, 2007. 297(4): p. 355-356.
- Gunnell, D., Eddleston, M., Michael R Phillips, M.R., Konradsen, F., *The global distribution of fatal pesticide self-poisoning: systematic review. BMC public health*, 2007. 7(1): p. 357.
- Colucci, E. and G. Martin, *Ethnocultural aspects of suicide in young people: A systematic literature review part 1: Rates and methods of youth suicide. Suicide and Life-Threatening Behavior*, 2007. 37(2): p. 197-221.
- Teevale, T., Lee, AC., Tiatia-Seath, J., Clark, TC., Denny S5, Bullen, P., Fleming, T., Peiris-John, RJ., *Risk and*

- protective factors for suicidal behaviors among Pacific youth in New Zealand. *Crisis*, 2016. 37(5): p. 335-346.
11. Gunnell, D. and M. Eddleston, Suicide by intentional ingestion of pesticides: a continuing tragedy in developing countries. 2003, Oxford University Press.
 12. Lee, W.J. and E.S. Cha, Overview of pesticide poisoning in South Korea. *J of Rural Medicine*, 2009. 4(2): p. 53-58.
 13. Wyatt, L.C., Tien Ung, T., Park, R., Simona C. Kwon, S.C., Trinh-Shevrin, C., Risk factors of suicide and depression among Asian American, Native Hawaiian, and Pacific Islander youth: A systematic literature review. *Journal of health care for the poor and underserved*, 2015. 26(2 0): p. 191.
 14. Mohammadnezhad M., Alqahtani, N.S., Salusalu, M.V., Konrote A., Prevalence, Determinants and Other Characteristics of Violence among Pacific Countries: A Systematic Review Study. *EC Psychology and Psychiatry* 2017. 5(2): p. 59-70.
 15. Mohammadnezhad M, Mangum T, and Konrote A, Inequalities and Barriers to the Use of Health Care among Cancer Patients in the Pacific: A Systematic Review. 2017, *J of Community Medicine & Health Education*. 7(4): p. 1-10.
 16. McDade, T.W., Status incongruity in Samoan youth: a biocultural analysis of culture change, stress, and immune function. *Medical Anthropology Quarterly*, 2002. 16(2): p. 123-150.
 17. Roberts, G.J., J. Leckie, and O. Chang, The History of Mental Health in Fiji, in *Mental Health in Asia and the Pacific*. 2017, Springer. p. 237-251.
 18. Lizardi, D. and R.E. Gearing, Religion and suicide: Buddhism, Native American and African religions, atheism, and agnosticism. *Journal of religion and health*, 2010. 49(3): p. 377-384.
 19. De Leo, D., Struggling against suicide: The need for an integrative approach. *Crisis: The Journal of Crisis Intervention and Suicide Prevention*, 2002. 23(1): p. 23.
 20. Wu, A., J.-Y. Wang, and C.-X. Jia, Religion and completed suicide: a meta-analysis. *PLoS One*, 2015. 10(6): p. e0131715.
 21. Tavite, A. and S. Tavite, Suicide in the Tokelau Islands. *Pacific health dialog*, 2009. 15(2): p. 67-83.
 22. Yip, P.S., Chen YY, Yousuf S, Lee CK, Kawano K, Routley V, Ben Park BC, Yamauchi T, Tachimori H, Clapperton A, Wu KC. Towards a reassessment of the role of divorce in suicide outcomes: Evidence from five Pacific Rim populations. *Social science & medicine*, 2012. 75(2): p. 358-366.
 23. Värnik, P., Suicide in the world. *International journal of environmental research and public health*, 2012. 9(3): p. 760-771.
 24. Callanan, V.J. and M.S. Davis, Gender differences in suicide methods. *Social psychiatry and psychiatric epidemiology*, 2012. 47(6): p. 857-869.
 25. Bostwick, J.M. and V.S. Pankratz, Affective disorders and suicide risk: a reexamination. *American Journal of Psychiatry*, 2000. 157(12): p. 1925-1932.
 26. Foliaki, S.A., Kokaua J, Schaaf D, Tukuitonga C., Twelve-month and lifetime prevalences of mental disorders and treatment contact among Pacific people in Te Rau Hinengaro: The New Zealand Mental Health Survey. *Australian and New Zealand journal of psychiatry*, 2006. 40(10): p. 924-934.
 27. Ritsher, J.B., P.G. Otilingam, and M. Grajales, Internalized stigma of mental illness: psychometric properties of a new measure. *Psychiatry research*, 2003. 121(1): p. 31-49.
 28. Platt, S., Inequalities and suicidal behaviour. *International handbook of suicide prevention: Research, policy and practice*, 2011: p. 211-234.

29. Möller-Leimkühler, A.M., The Gender Gap in Suicide and Premature Death or: Why Are Men So Vulnerable? *European Archives of Psychiatry and Clinical Neuroscience*, 2003. 253(1):p. 1-8.
30. Aghanwa, H.S., The characteristics of suicide attempters admitted to the main general hospital in Fiji Islands. *Journal of psychosomatic research*, 2000. 49(6): p. 439-445.
31. Aghanwa, H.S., Attempted suicide by drug overdose and by poison-ingestion methods seen at the main general hospital in the Fiji islands: a comparative study. *General hospital psychiatry*, 2001. 23(5): p. 266-271.
32. Aghanwa, H., The determinants of attempted suicide in a general hospital setting in Fiji Islands: a gender-specific study. *General hospital psychiatry*, 2004. 26(1): p. 63-69.
33. Amadéo, S.p., Rereao M, Malogne A, Favro P, Nguyen NL, Jehel L, Milner A, Kolves K, De Leo D., Testing brief intervention and phone contact among subjects with suicidal behavior: a randomized controlled trial in French Polynesia in the frames of the World Health Organization/Suicide Trends in At-Risk Territories study. *Mental illness*, 2015. 7(2): P. 48-53.
34. Wong, S.S., Sugimoto-Matsuda JJ, Chang JY, Hishinuma ES., Ethnic differences in risk factors for suicide among American high school students, 2009: The vulnerability of multiracial and Pacific Islander adolescents. *Archives of suicide research*, 2012. 16(2): p. 159-173.
35. Forster, P.M., S.C. Kuruleca, and C. Auxier, A note on recent trends in suicide in Fiji. *Journal of Pacific Rim Psychology*, 2007. 1(1): p. 1-4.
36. Innamorati, M., De Leo D, Rihmer Z, Serafini G, Brugnoli R, Lester D, Amore M, Pompili M, Girardi P., Tobacco smoking and suicidal ideation in school-aged children 12–15 years old: Impact of cultural differences. *Journal of addictive diseases*, 2011. 30(4): p. 359-367.
37. Pinhey, T.K. and S.R. Millman, Asian/Pacific Islander adolescent sexual orientation and suicide risk in Guam. *American journal of public health*, 2004. 94(7): p. 1204-1206.
38. Roberts, G., Cohen J, Khan N, Irava W., Attempted suicide in western VitiLevu, Fiji. *Health Promotion in the Pacific*, 2007. 14(2): p. 29.
39. Thapa, P., Sung Y, Klingbeil DA, Lee CY, Klimes-Dougan B., Attitudes and perceptions of suicide and suicide prevention messages for Asian Americans. *BehavioralSci*, 2015. 5(4): p. 547-564.
40. Beautrais, A.L., Child and young adolescent suicide in New Zealand. *Australian and New Zealand Journal of Psychiatry*, 2001. 35(5): p. 647-653.
41. Wong, Y.J., Wang L, Li S, Liu H., Circumstances preceding the suicide of Asian Pacific Islander Americans and White Americans. *Death studies*, 2017. 41(5): p. 311-317.
42. Peltzer, K. and S. Pengpid, Early substance use initiation and suicide ideation and attempts among school-aged adolescents in four Pacific Island Countries in Oceania. *International journal of environmental research and public health*, 2015. 12(10): p. 12291-12303.
43. Chan, S., Denny S, Fleming T, Fortune S, Peiris-John R, Dyson B., Exposure to suicide behaviour and individual risk of self-harm: findings from a nationally representative New Zealand high school survey. *Australian & New Zealand Journal of Psychiatry*, 2018. 52(4): p. 349-356.
44. Strickland, C.J., E. Walsh, and M. Cooper, Healing fractured families: Parents' and elders' perspectives on the impact of colonization and youth suicide prevention in a Pacific Northwest American Indian tribe. *Journal of Transcultural Nursing*, 2006. 17(1): p. 5-12.

45. Tiatia-Seath, J., Pacific peoples, mental health service engagement and suicide prevention in Aotearoa New Zealand. *Ethnicity and inequalities in health and social care*, 2014. 7(3): p. 111-121.
46. Fleming, T.M., Merry SN, Robinson EM, Denny SJ, Watson PD., Self-reported suicide attempts and associated risk and protective factors among secondary school students in New Zealand. *Australian and New Zealand Journal of Psychiatry*, 2007. 41(3): p. 213-221.
47. Beautrais, A.L., Wells JE, McGee MA, Oakley Browne MA., Suicidal behaviour in Te Rau Hinengaro: the New Zealand mental health survey. *Australian and New Zealand Journal of Psychiatry*, 2006. 40(10): p. 896-904.
48. Else, I.R., N.N. Andrade, and L.B. Nahulu, Suicide and suicidal-related behaviors among indigenous Pacific Islanders in the United States. *Death studies*, 2007. 31(5): p. 479-501.
49. Siale A., Jesse K, David S, Colin T. Twelve-month and lifetime prevalence of mental disorders and treatment contact among Pacific people in Te Rau Hinengaro: The New Zealand Mental Health Survey. *Australian and New Zealand Journal of Psychiatry* 2006; 40:924–934
50. Blasco-Fontecilla, H., Perez-Rodriguez, M.M., Garcia-Nieto, R., Fernandez-Navarro, P., Galfalvy, H., de Leon J., Baca-Garcia, E., Worldwide impact of economic cycles on suicide trends over 3 decades: differences according to level of development. A mixed effect model study. *BMJ open*, 2012. 2(3): p. e000785.
51. Else, I.R., Goebert, D.A., Bell, C.K., Carlton, B., Fukuda, M., The relationship between violence and youth suicide indicators among Asian American and Pacific Islander youth. *Aggression and Violent Behavior*, 2009. 14(6): p. 470-477

ASSESSMENT OF METACERCARIAE INFECTION OF EDIBLE CRABS IN AN AREA ENDEMIC FOR PARAGONIMIASIS IN THE CROSS RIVER BASIN

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ABSTRACT:

This study was aimed at assessing the epidemiology of paragonimiasis in two coastal communities with definite interests in ascertaining the infection rates of *Sudanautes* with *Paragonimus uterobilateralis* metacercariae in those in their natural habitats and those purchased in local markets in the Cross River Basin. Crabs were trapped using the local methods used by the local population. In addition, crabs, supplied by local fishermen, were purchased from the market. The carapace of freshly collected or purchased crabs was broken and contents were examined under the dissecting microscope. The positive case infection was established by presence of metacercariae in the crab. In Akpabuyo and Calabar South, the highest monthly prevalence of *P. uterobilateralis* metacercariae in crabs in their natural habitats (6.6% and 8.3% respectively) and in those purchased in local markets (7.0% in both areas) was recorded in the month of September. The mean number of crabs collected from their natural habitats were significantly higher in the wet than dry season in both Akpabuyo ($p = 2.98$) and Calabar South ($p = 2.64$). In Akpabuyo, the overall prevalence of crab metacercariae infection among purchased crabs was higher than among those caught in their natural habitats, but this was not statistically significant ($p = 0.664$). In Calabar South, metacercariae infection among crabs caught from their natural habitats was not significantly higher than among those purchased in the local market ($p = 0.041$). The percentages of infected crabs were 5.3% and 5.8% in the wet season, and 5.9% and 4.4% respectively in the dry season. Overall, metacercariae infection rate of edible crabs (both those caught in their natural habitats and those purchased in markets pooled together) was 5.4% in Akpabuyo and 5.2% in Calabar South. There is a high metacercariae infection rate among crabs in South-eastern Nigeria, which necessitates an urgent need for innovative measures to discourage the local population from eating improperly cooked crabs.

Keywords: Metacercariae, edible crabs, paragonimiasis, seasonality

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INTRODUCTION:

Paragonimiasis is a neglected but re-emerging zoonotic parasite infection in Nigeria [1]. It is one of the most important food-borne parasitic zoonoses caused by one or more of the trematode species of the genus *Paragonimus* [2]. Known also as endemic haemoptysis or parasitical haemoptysis, it is a sub-acute to chronic inflammatory disease of the lung [3] affecting twenty million people [4], with 293 million at risk of the disease worldwide [5]. *Paragonimus* species infect more people globally than any other food-borne trematode, reportedly causing an estimated 196,710 disability adjusted life-years [6]. It might be more serious than reported, as these estimates do not account for infections in Africa. Paragonimiasis constitutes a major public health concern especially in the tropical and sub-tropical regions. The disease is endemic in many parts of Africa, Asia and South America [7]. In Africa, paragonimiasis is geographically clustered around the inter-tropical zone [8] as 80% of the 10 countries in the continent, where paragonimiasis has been reported, are located in this zone.

Edible crab species *Sudanautes* has been earlier confirmed as the intermediate host of *Paragonimus uterobilateralis* in south-eastern Nigeria [9]. Preliminary investigations into the crab-eating behaviour of an endemic population have been reported in six communities from two ethno-cultural clusters in South-eastern

Nigeria and observations indicate that the risk of paragonimiasis is related to the frequency of eating of *Sudanautes* [1].

Most cases of paragonimiasis around the world have been associated with ingestion of improperly cooked crayfish, crabs, and prawns, while some are associated with raw crabs or crayfish used in traditional medications as obtainable in Korea, Japan, and some parts of Africa. These crabs, prawns, and crayfish are infected with infective metacercariae [8].

In Nigeria, endemic foci have been reported in the Cross River Basin with comparable prevalence rates in Yakurr Local Government Area as reported in different studies: 12 % [10], 9.6%; [11], and 8.6% [12]. Another endemic focus was reported in Akamkpa Local Government Area [13]. Furthermore, other geographic regions where high prevalence of paragonimiasis disease has been reported include Cameroon, an area contiguous to Akpabuyo and Calabar South; two areas included in our present study. The intermediate and definitive hosts of *P. africanus* are found throughout the contiguous forest of south-eastern Nigeria bordering Cameroon [14, 15], suggesting that *P. africanus* could be more widely distributed here than is currently appreciated.

Massive eating of crabs and crayfish has been reported to have continued in parts of south-eastern Nigeria decades after the second outbreak of paragonimiasis in the area [1]. This

has become a public health concern since paragonimiasis is acquired as a result of consumption of raw or improperly cooked or pickled freshwater crabs or crayfish harbouring infective metacercariae. Eating habits and closeness to water bodies is known to influence the transmission of parasitic infections since most of the fresh water products are infected with the infective metacercariae. It has become necessary to study the current status of paragonimiasis in coastal regions of Cross River State where this crab-eating practice is popular. This study provides empirical data to the stakeholders especially the health authorities that would help construct a more effective and robust paragonimiasis intervention plan in the area.

Furthermore, familial clustering has been reported in some parasitic infections including schistosomiasis [16, 17] and trichuriasis [18]. Filarial disease has been reported to aggregate in families [19, 20], and microfilarial levels have also been reported to be attributable to genetic factors [21]. Susceptibility to filarial disease and its clinical spectrum have been said to be determined by a gene associated with the histocompatibility complex [22, 23, 24]. Indeed, host genetic factors play an important role in determining both the nature of the responses to some vector-borne infection and the variability observed in pathologic outcome as exemplified in filariasis [25, 26], and hydrocele [27]. However, in paragonimiasis, it seems that familial flocculation and spatial household

clustering of infection in endemic area is more of a function of crab-eating frequency and behaviour [1, 28].

Furthermore, there is paucity of information on the seasonal abundance of *Sudanautes* and its seasonal rate of infection with *P. uterobilateralis* metacercariae. This is an important missing link in paragonimiasis research since seasonal variation in crab populations and the level of crab infection are important epidemiological factors in paragonimiasis transmission [29]. Thus seasonal investigation to obtain data on these parameters should make a significant addition to knowledge in the epidemiology of paragonimiasis. This study was therefore aimed at assessing the epidemiology of paragonimiasis in two coastal communities with definite interests in ascertaining the infection rates of *Sudanautes* with *P. uterobilateralis* metacercariae in those in their natural habitats and those sold in local markets in the Cross River Basin.

MATERIALS AND METHODS:

The study was conducted between the months of June and December, 2017.

Description of the study area:

The study was carried out in two coastal communities, Akpabuyo and Calabar South in Akpabuyo and Calabar South Local Government Areas respectively. These two communities are within the rain forest zone of Cross River State Nigeria.

Akpabuyo is a rural community with monolithic population in Akpabuyo Local Government Area (LGA) of Cross River State (CRS). It has a land area of 28.5 km² and a population of 271,395 in the 2006 national census [30]. Akpabuyo LGA lies between latitude 4° 5' and 5° 40' and longitude 8° 25' and 8° 32 East. It is within the vegetation belt of southern Nigeria and shares the Atlantic coastline with Bakassi to the East and the Republic of Cameroon to the West. The major ethnic groups are the Efiks, Quas and Efuts. The major languages spoken are Efik and English, while all the major ethnic groups share a common cultural and ancestral heritage. In these communities, crabs are caught by people in all categories of occupation for both subsistence and commercial purposes. The people of Akpabuyo are predominantly fishermen/ women, farmers and artisans. The area comprised mainly of the indigenous people. Akpabuyo is predominantly an agricultural area, and is known as the Food Basket of CRS. It produces cassava, cocoyam, kola nut, coconut, palm produce as well as sea foods. The land is rich in mineral deposits such as petroleum deposits, gold, limestone, sand and slat deposits to mention a few [31].

Calabar South is an urban community and cosmopolitan, it has a land area of 264 km² and a population of 191,630 from the 2006 national census. The area hosts a great influx of non-indigenous people from other regions of Nigeria. The area is semi-urban in setting and is comprised of people of various occupations

including fishermen, artisans, traders, students, and civil servants. In this community, crabs are regarded as traditional delicacy and are caught, sold in markets in the local or neighbouring communities.

Collection of crabs:

Two groups of crabs were used in the present study. The first group consisted of crabs trapped using the local methods reported in an earlier study in an endemic area proximal to the study area [28]. This traditional trap method was adopted because that was the normal method used by the local population. The second group of crabs were those supplied by local fishermen, and also purchased from the markets.

Dissection of crabs:

Freshly collected or purchased crabs were dissected using standard procedures [15]. The carapace was broken using a hammer, and the contents were examined under dissecting microscope. The positive case infection was established by presence of metacercariae in the crab [15].

Ethical approval for the study was received from the Cross River University of Technology Ethical Committee.

Data analysis:

Epi Info version 6.0 was used in entering data, and SPSS for windows was used for data analysis. Statistical analyses were carried out on differences between prevalence of infection using chi-square tests. $P < 0.05$ was considered

statistically significant. ANOVA was used in comparing means of intensities.

RESULTS:

Infection rates *Paragonimus* metacercariae in edible crabs were assessed in two groups of crabs; those crabs caught in their natural habitats and those purchased in the markets in both Akpabuyo and Calabar South.

Monthly prevalence of *Paragonimus* metacercariae in edible crabs caught in their natural habitats and in those purchased in the markets in Akpabuyo is presented in Table 1. The overall prevalence of *Paragonimus* metacercariae among crabs purchased in the market was not significantly higher than among those caught in their natural habitats ($p = 0.009$). Prevalence of metacercariae infection among crabs caught in their natural habitat was higher in the months of July, October, and November while Crabs purchased in the markets had higher metacercariae infection than those caught in their natural habitat in the months of June, August, and September, but these were not statistically significant ($p = 0.009$).

Monthly prevalence of *Paragonimus* metacercariae in edible crabs caught in their natural habitats and in those purchased in the market in Calabar South is presented in Table 2. Metacercariae infection among crabs caught from their natural habitats was higher than among those sold in the local market both in the overall, and in the months of July, August,

September, and November, but the differences were not statistically significant ($p = 0.876$).

Seasonality of Mean abundance and infection rate of edible crabs:

Seasonality of relative abundance of crabs caught, and of percentages of total infected crabs caught in Akpabuyo and Calabar South is presented in Figure 1. The mean number of crabs caught in the wet season was 294 and was significantly higher than that (135) for the dry season ($p = 2.98$). The percentage of infected crabs caught in the wet season (5.3%) was lower than that (5.9%) in the dry season, but the difference was not statistically significant ($p = 0.664$).

Seasonality of relative abundance of crabs caught, and of percentages of total infected crabs caught in Calabar South is also presented in Figure 1. The mean number of crabs caught in the wet season was 264 and was significantly higher than that (124) for the dry season ($p = 2.64$). The percentage of infected crabs caught in the wet season (5.8%) was not significantly higher than that (4.5%) in the dry season ($p = 0.041$).

The monthly infection rate of edible crabs with *Paragonimus* metacercariae in Akpabuyo and Calabar South, both those caught in their natural habitats and those purchased in markets were pooled together and presented in Table 3. The total number of edible crabs examined in Akpabuyo was 2,046. The monthly number of edible crabs examined was highest (448) in August and lowest (188) in November.

The overall infection rate was 5.4%. The monthly infection rate was highest (6.7%) in September and lowest (3.8%) in July. In Calabar South, total number of edible crabs examined was 1,903. The monthly number of

edible crabs examined was highest (433) in August and lowest (179) in November. The overall infection rate was 5.2%. The monthly infection rate was highest (8.0%) in September and lowest (3.7%) in October.

Table 1: Comparison of Monthly prevalence of *Paragonimus metacercariae* between edible crabs caught in their natural habitats and those sold in the market in Akpabuyo

Month	Crabs caught from natural habitats		Crabs purchased in market		Chi-square (p=0.05)
	Number examined	Positive crabs N (%)	Number examined	Positive crabs N (%)	
June	244	14 (5.7)	100	7 (7.0)	0.197
July	299	12 (4.0)	100	3 (3.0)	0.213
August	348	17 (4.9)	100	5 (5.0)	0.002
September	286	19 (6.6)	100	7 (7.0)	0.150
October	181	11 (6.1)	100	6 (6.0)	0.000
November	88	5 (5.7)	100	5 (5.0)	0.043
Total	1446	78 (5.4)	600	33 (5.5)	0.009

Table 2: Comparison of Monthly prevalence of *Paragonimus metacercariae* between edible crabs caught in their natural habitats and those sold in the market in Calabar south

Month	Crabs caught from natural habitats		Crabs purchased in market		(Chi-square) (p=0.05)
	Number examined	Positive crabs N (%)	Number examined	Positive crabs N (%)	
June	185	8 (4.3)	100	5 (5.0)	310.42 p < 0.05
July	261	11 (4.2)	100	3 (3.0)	72.04 p < 0.05
August	333	19 (5.7)	100	3 (3.0)	126.2; p < 0.05
September	277	23 (8.3)	100	7 (7.0)	83.64; p < 0.05
October	168	6 (3.5)	100	4 (4.0)	17.28; p < 0.05
November	79	5 (6.3)	100	5 (5.0)	2.60; p > 0.05
Total	1303	72 (5.5)	600	27 (4.5)	260.46; p < 0.05

Figure 1: Seasonality of relative abundance of crabs caught and of percentages of total infected crabs in Akpabuyo and Calabar South.

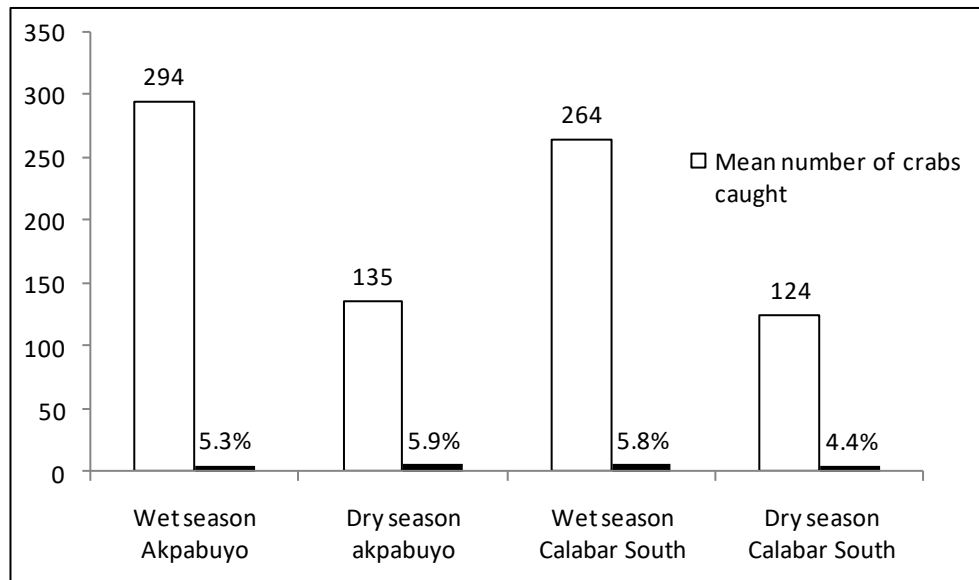


Table 3: Overall monthly infection rate of edible crabs (both those caught in their natural habitats and those purchased in markets pooled together) with *Paragonimus metacercariae* in Akpabuyo and Calabar South

Months	Akpabuyo		Calabar South	
	Number of crabs	Number of crabs found positive (%)	Number of crabs	Number of crabs found positive (%)
June	344	21 (6.1)	285	13 (4.6)
July	399	15 (3.8)	361	14 (3.9)
August	448	22 (4.9)	433	22 (5.1)
September	386	26 (6.7)	377	30 (8.0)
October	281	17 (6.0)	268	10 (3.7)
November	188	10 (5.3)	179	10 (5.9)
Total	2046	111 (5.4)	1903	99 (5.2)

DISCUSSION:

Although transmission of paragonimiasis is not seasonal in South-eastern Nigeria [28],

metacercariae infection rate in edible crabs seems to be at its pick in the month of September as observed in this study and also

reported in an earlier study [1]. The epidemiological parameters recorded from crabs caught in their natural habitats showed high infection rate. Massive consumption of crabs in the area is driven mostly by the level of education and therefore could be attributed to extent of awareness of the health implications of such dietary behaviour [29]. Better awareness of the population regarding the implications to their health of consuming infected crab would lead to better and proper preparation of crab meals before consumption. On the other hand, better level of education most times could translate into better economic wellbeing, which means being in a better position to afford meat rather than relying on cheaper alternatives such as crab meals [1]. Behavioural change must be a prominent part of any successful control strategies in South-eastern Nigeria. However, provision of alternative sustainable and inexpensive solutions to cause behavioural change has also been a restraint for many control programs [32]. Human behaviour plays a fundamental role in the epidemiology of parasitic infections such as paragonimiasis, both its emergence and spread. Human behaviour is further complicated by the impacts of cultural, religious, ethnic, age and gender related variables. To have a desirable outcome in paragonimiasis control in the area, behavioural change must be directed to either curbing the frequency of crab-eating or to properly cook them before eating. Secondly, there must be an

alternative plan to encourage massive breeding and provision of infection-free crabs on a commercial scale for committed eaters. The crab species *S. africanus* is reported to have high fecundity, producing many eggs per individual, which is an indication that they are viable for farm production, and can be bred in captivity [33]. Selective breeding for rapid growth can be engineered to obtain more attractive and delicious species that will compete favourably with their naturally occurring counterparts.

The monthly prevalence was significantly different between the two groups of crabs in all the months in both study areas except for the month of November in Calabar South where it was comparable. Metacercariae infection was not consistently higher in any particular group of crabs in this study. However, the overall metacercariae infection rate of edible crabs in this study was relatively low compared to that reported from some endemic countries outside Africa. In the Amazon, *P. mexicanus* metacercariae were found in 96.1% of the crab *Moreirocarinus emarginatus* (formerly referred to as *Zilchiopsis ecuadoriensis*) individuals examined, whereas none of the *Trichodactylus faxoni* (formerly referred to as *Trichodactylus maytai*) crabs captured were parasitized [34].

CONCLUSION:

There was a high metacercariae infection rate among crabs in South-eastern Nigeria, which necessitates an urgent need for innovative

measures to discourage the local population from eating improperly cooked crabs. Mass education and awareness campaign to provoke changes in customs and food preparation practices of crabs should be emphasized in South-eastern Nigeria. The epidemiology and economic importance of paragonimiasis should be explained in such a way that majority of the people would be adequately informed about the risks of their food choices and food preparation preferences.

REFERENCES:

1. Uttah, E.C. (2013a). Paragonimiasis and Renewed Crab-Eating Behavior in Six Communities from Two Ethnocultural Clusters in South-eastern Nigeria. *ISRN Infectious Diseases* 2013; Volume 2013: 1-5. Article ID 569485. <http://dx.doi.org/10.5402/2013/569485>
2. Okoro, N., R. Azu, K. Onyeagba, C. Anyim, O.E. Eda, C.S. Okoli, L. Orji, and E.C. Okonkwo. Prevalence of Paragonimus infection. *American Journal of Infectious Diseases* 2013; 9 (1): 17-23.
3. Liu, Q., F. Wei, W. Liu, S. Yang, and X. Zhang. Paragonimiasis: an important food-borne zoonosis in China. *Trends in Parasitology* 2008; 24: 318–23.
4. Toscano, C., Y.S. Hai, and K.E. Mott. Paragonimiasis and tuberculosis, diagnostic confusion: a review of literature. *Tropical Diseases Bulletin*, 1995; 92 (2); R1–R27.
5. World Health Organisation. Control of food borne trematode infections. Report of WHO study group, Technical Report 1995 Series No. 849 Geneva.
6. Fürst, T. J. Keiser, and J. Utzinger. (2012). Global burden of human food-borne trematodiasis: a systematic review and meta-analysis. *Lancet Infectious Diseases* 2012; 12:210-221.
7. Procop, G.W. North American paragonimiasis (caused by *Paragonimus kellicotti*) in the context of global paragonimiasis. *Clinical Microbiology Reviews* 2009; 22 (3): 415–446.
8. Aka, N., K. Adoubryn, S. Rondelaud, and G. Dreyfuss. (2008). Human paragonimiasis in Africa, *Annals of African Medicine* 2008; 7 (4):153-162.
9. Udonsi, J.K. Endemic Paragonimus infection in upper Ikwun Basin, Nigeria: a preliminary report on a renewed outbreak. *Annals of Tropical Medicine and Parasitology* 1987; 81 (1): 57–67.
10. Arene, F.O. E. Ibanga, and J.E. Asor. Epidemiology of paragonimiasis in Cross River basin, Nigeria: prevalence and intensity of infection due to *Paragonimus uterobilateralis* in Yakurr local government area. *Public Health* 1998; 112 (2):119-122.
11. Asor, J.E. S.E. Ibanga, and F.O.I. Arene. *Paragonimus uterobilateralis*: peak period of egg output in sputum of infected subjects in Cross River basin, Nigeria. *Mary Slessor Journal of Medicine* 2003; 3:24-27.
12. Ibanga, E.S., F.O.I. Arene, and J.E. Asor. Association of pulmonary paragonimiasis with active pulmonary tuberculosis in rural Yakurr community in Cross River Basin, Nigeria. *Mary Slessor Journal of Medicine* 2003; 3:19-23.
13. Ibanga, E. S. and V. M. Eyo. Pulmonary paragonimiasis in Oban community in Akamkpa Local Government area, Cross River State, Nigeria: prevalence and intensity of infection. *Transactions of the Royal Society of Tropical Medicine and Hygiene* 2001; 95:159-160.
14. Kingdon, J. *The Kingdon Pocket Guide to African Mammals*. 2005; Princeton University Press, Princeton.

15. Abraham, J. T. and P. A. Akpan. Vectors of *Paragonimus Uterobilateralis* a Causative Fluke for Paragonimiasis in Cross River State, Nigeria. *Africa Research Review* 2011; 5 (1): 414-423.
16. Bethony, J. J. T., Williams, and J. Blangero. Additive host genetic factors influence fecal egg excretion rates during *Schistosoma mansoni* infection in a rural area in Brazil. *American Journal of Tropical Medicine and Hygiene* 2002; 67: 335–343.
17. Booth, M. M. A. Shaw, and D. Carpenter. Carriage of DRB1*13 is associated with increased posttreatment IgE levels against *Schistosoma mansoni* antigens and lower long-term reinfection levels. *Journal of Immunology* 2006; 176: 7112–7118.
18. Williams-Blangero S, S. T. McGarvey, J. Subedi, P. M. Wiest, R. P. Upadhyay, D. R. Rai B. Rha, G. R. Olds, W. Guanling, J. Blangero. Genetic component to susceptibility to *Trichuris trichiura* : evidence from two Asian populations. *Genetics Epidemiology* 2002; 22: 254-264.
19. Ottesen, E. A. N. R. Mendell, J. M. MacQueen, P. F. Weller, D. B. Amos, and F. E. Ward. Familial predisposition to filarial infection —not linked to HLA-A or -B locus specificities. *Acta Tropica*. 1981; 38: 205–216.
20. Cuenco, K.T., M. E. Halloran, and P. J. Lammie. Assessment of families for excess risk of lymphedema of the leg in a lymphatic filariasis-endemic area. *American Journal of Tropical Medicine and Hygiene* 2004; 70:185–190.
21. Terhell, A. J. J. Houwing-Duistermaat, Y. Ruiterman, M. Haarbrink, K. Abadi, and M. Yazdanbakhsh. Clustering of *Brugia malayi* infection in a community in South-Sulawesi, Indonesia. *Parasitology*. 2000; 120:23–29.
22. Meyer G., M. Lemaire, C. Ros, K. Belak, A. Gabriel., D. Cassart, F. Coignoul, S. Belak, and E. Thiry. Comparative pathogenesis of acute and latent infections of calves with bovine herpesvirus types 1 and 5. *Arch. Virology* 2001; 146:633-652.
23. Yazdanbakhsh, M., S. Erliyani, Y. C. M. Kruize, and R. P. de Vries (1995). HLA and elephantiasis in lymphatic filariasis. *Human Immunology* 1995; 44(1): 58-61. DOI: 10.1016/0198-8859(95)00059-D
24. Zhang, L. Q. Y. Wu, H. Hu, H. Wu, and F. Wei (2015). Major histocompatibility complex alleles associated with parasite susceptibility in wild giant pandas. *Heredity (Edinburg)* 114(1): 85-93. PMC4815596
25. Choi, E. H., P. A. Zimmerman, and C. B. Foster. Genetic polymorphisms in molecules of innate immunity and susceptibility to infection with *Wuchereria bancrofti* in South India. *Genes Immunology* 2001; 2: 248–253.
26. Cuenco, K. T. E. A. Ottesen, S. A. Williams, T. B. Nutman, and C. Steel. Heritable Factors Play a Major Role in Determining Host Responses to *Wuchereria bancrofti* Infection in an Isolated South Pacific Island Population. *The Journal of Infectious Diseases* 2009; 200: 1271–1278.
27. Debrah, A.Y. S. Mand, S. Y. Marfo-Debrekyei, J. Larbi, O. Adjei, and A. Hoerauf. Assessment of microfilarial loads in the skin of onchocerciasis patients after treatment with different regimens of doxycycline plus ivermectin. *Filaria Journal* 2006, 5:1 doi:10.1186/1475-2883-5-1.
28. Uttah, E.C. Prevalence of human edible crabs infected with *Paragonimus uterobilateralis* metacercariae in South-eastern Nigeria. *Pacific Journal of Medical Sciences* 2013; 11(1): 12-20.
29. Hosseini, M., A. Vazirizade, Y. Parsa, and A. Mansori. Sex Ratio, Size Distribution and Seasonal Abundance of Blue Swimming Crab. *World Applied*

- Sciences Journal 2012; 17 (7): 919-925.
30. Edem, A., M. Ntekpe, and N. Umoeakam. Prevalence of Syphilis and Gonorrhoea in Patients Attending General Hospital, Calabar, Nigeria. *International Journal of Modern Biology and Medicine* 2013; 4(3): 155-168.
 31. Ojukpong, G. Studies on the Epidemiology of Paragonimiasis in two coastal selected communities in Calabar suburbs. MSc Thesis 2017; Cross River University of Technology, Calabar, Nigeria, 123 pages.
 32. Azim, S. F. S. S. Dojki, and M. A. Ahmad. Role of Human Behaviour and Parasitic Diseases". *Infectious Diseases Journal Pakistan* 2008; 17(4): 128-134.
 33. Bello Olusoji, O.A., O. J. Anifowose, and M. Y. Sodamola. Length-Weight Relationships, Condition Factor and Fecundity of the West Africa Freshwater Crab, *Sudanautes africanus* (Milne-Edwards 1883), in Western Nigeria. *West African Journal of Applied Ecology* 2009; 16: 65-74.
 34. Amunárriz UM 1991. Enfermedad de Chagas; primer foco amazónico, p. 27-36. In *Estudios sobre Patologías Tropicales en la Amazonía Ecuatoriana* Cicame, Pompeya, Ecuador.

BREAST CANCER IN PAPUA NEW GUINEA AND OTHER PACIFIC ISLAND COUNTRIES: A REVIEW

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ABSTRACT:

Breast cancer is among the top five cause of mortality among young women in Papua New Guinea and the Pacific Island countries. Most of these women usually present to their hospitals with advanced breast cancer stages and almost all outcomes are poor. This is largely due to progressive change in their cultural and socio economic status and beliefs about health and diseases like cancer. Western lifestyle and diets have shown positive association in developing breast cancers among women from these countries. At present these countries have limited available resources or almost none for cancer care and management, therefore early public health interventions and education about cancer is the way forward for all the countries in the region. Despite the increasing international assistance in funding and programs, host nations in the pacific are yet to show ownership about their disease burden and public health policies.

Keywords: Breast cancer, Risk, Pacific, Papua New Guinea

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INTRODUCTION:

Cancer is a dreaded pandemic disease. According to WHO and Global cancer statistics, the number of new cases and cancer mortality has been increasing over the last decade [1, 2]. This projection is highly unlikely to decrease in the near future as public health practices and the epidemiological dynamics, shifts within and between developed countries and developing countries.

Global information revealed that breast cancer is the number one cause of cancer deaths among women [1, 2]. On the regional perspective, breast cancer is the second highest cause of death after cervical cancer in Pacific Island women [2]. This trend is unlikely to change in the near future while breast cancer mortality in women in Australia and New Zealand have reached a plateau and is showing signs of falling [1-3].

Breast Cancer like cervical cancer in Pacific Island women has a moderate difference in occurrence and the overall dynamics on diagnosis and treatment compared to other regions and countries. This review article discusses breast cancer among Pacific Islanders and its many compounding variables, current available cancer services and the local government programs on cancers. The international quota on cancer services for these countries will also be further discussed. This review provides understanding about the current breast cancer status among Papua New Guinean and other Pacific Island women and provides insight for future interventions.

Definition:

Breast cancer is the cancer that arises generally from the breast tissue or mammary gland. The breast is made up of the multiple acini and lobules, which produce milk, and the ducts that connect the lobules to the nipple, collectively called the functional unit of the breast [3]. Cancer can also arise from the other neighboring tissue or supporting tissues on the chest wall like the muscle, fatty tissue, lymphatics, blood vessel tissue and the chest wall bones or ribs and cartilages. In clinical practice and in this review, breast cancer will be highly referred to the breast tissue proper and its axillary tail or extension into the axillae only.

Recent Background on Breast cancer:

Until now as reported by GLOBOCAN 2018[2] on breast cancer, there are 2 million new cases of breast cancer globally since 2017 with just over 600,000 deaths. In the Western Pacific region in which this paper focuses on, age standardized incidence rates in females per 100,000

showed the following; Australia 94.5, New Zealand 92.6, Fiji 63.4, Vanuatu 29.5, New Caledonia 98.0 and Solomon Islands 45.6. While mortality rates per 100,000 has shown that Australia scores 12.3, New Zealand 14.2, Fiji 36.9, Vanuatu 12.5, New Caledonia 18.3 while in the Solomon Islands it is 14.9 [4]. Despite Australia and NZ being within the region of interest, they are developed countries. Their incidence rate of breast cancer morbidity is high, yet their mortality rate has reached a plateau or is decreasing due to having more resources and interventional programs on the care of cancer patients. The opposite is seen in the developing Pacific Island countries.

In Papua New Guinea (PNG), during a thirty-year retrospective study from the cancer registry since 1958, Sengupta and colleagues [5] reported an incidence of 2.7/100,000 in 1990. Ten years later, Halder and others [6] reported an increase to 6.9/100,000 in 1998. This rate has unequivocally increased to 45.8 per 100,000 in 2018 with a high mortality rate of 25.2 per 100,000 [4]. During the primary study, Sengupta et al [5] noticed age specific increase in age group of 40 to 49 years, but it was a younger age group in 35 to 45 years in the study by Halder [6].

While it is refreshing to know about the current statistics, PNG did not have a proper cancer registry of all cancer patients since the early 1980s when it was improperly managed and ceased reporting and archiving. The most recent figures suggest an estimated trend projected from the past or as per case reporting from few individual hospitals.

Pathology of Breast Cancer:

The most common breast cancer presentation among the Pacific Island

women including PNG is abreast lump with invariable sizes. In a prospective study of women with breast lumps at Port Moresby General Hospital (PMGH) between 2008 to 2015 Waine et al [7] found that 60% of women presenting with a breast lump have confirmed histology diagnosis of cancer. Other causes of breast lumps are mastitis, breast ulcer, infection with abscess and discharging nipple [7].

Sixty six percent of the histological diagnosed breast cancers were invasive ductal carcinoma. Others in descending order were poorly differentiated carcinoma (6.8%), medullary (5.7%) and adenocarcinoma (5.4%) of the breast [8]. Age specific group with high incidence in PNG is between 30 to 45 years. Most are otherwise premenopausal [8]. In PNG, a young age woman who presents on first visit to the clinic with clinical breast lump size or grading of 2B (2-4 cm size lump) has about 65.2 % chances of developing metastasis [7]. Again most of this will be based on each case report or on incidental reporting and a similar observation was said for the other Pacific Islanders [9]. During the recent past twenty years, Fiji has started creating a central cancer registry for other Pacific island countries where reporting is coordinated. Their statistics are about the same as seen in PNG [9].

Etiological Risk factors:

There are few main features that delineate women in the Pacific Islands from the western world on risk factors associated with breast cancer. Understanding this provides the main component of the health awareness and educational aspect of cancer in the family and communities. It has been shown that there is an association between diets, mostly

introduced high fat western diet, with breast cancer. Lack of physical exercise and fertility are also known factors associated with increased breast cancer incidence [10-14] especially in women living in medium and low income countries within the Asia Pacific region [15].

Most Papua New Guinean women and other Pacific Islanders usually live a traditional lifestyle, in which their diets are mostly traditional foods and less westernized foods. Most times these women are physically active until their late forties (Average Life span is 58 years) [16]. These women would have married early and have many children [16]. Menarche for them starts late while menopause sets in early thus, their exposure to estrogen is rather short compared to most women from other regions and women from the developed world [17, 18]. These factors have generally been attributed to less predictive association with breast cancer incidences.

Early menarche, late menopause, older age at first delivery, and a lower number of full term pregnancies are also associated with higher incidence of breast cancer [2]. Case control studies have shown positive relationship on this reproductive behavioral pattern on breast cancers in most Asian women and have recently been shown for Pacific Islanders as well [19-23]. This fertility pattern is on the rise, [14] especially with the concurrency of family planning usage among young women in the region which increases susceptibility to develop breast cancer [24].

Pip et al [25] noted that about 54% of their study population in PNG had negative receptor markers for both progesterone and oestrogen. Only about 4% had positive receptors for both hormones. In comparison, American whites had 20% and

blacks 35% negative receptors for both hormones and positivity for both hormone receptors were 60 and 44% respectively [25]. While most Asia-Pacific women with breast cancer have a high tendency to have progesterone and estrogen receptor negative (PR- / ER-) cancers [15,26], recent studies in Malaysia are now showing that ER +ve is now increasing in breast cancer at a rate of 2% every five years [27]. Other lifestyle risk factors that are associated with breast cancer are [28]; smoking [29, 30] excessive alcohol intake [30-32] and a very high body mass index [33, 34].

Genetic factors between family relationships are known as a positive correlation. The risk of developing breast cancer is higher if a mother, sister or daughter has had breast cancer [2]. Hereditary breast cancer is commonly due to a mutation in the BRCA1 and BRCA2 genes [35]. Particular ethnic groups may also have a greater risk of developing breast cancer due to the high prevalence of the BRCA1 and BRCA2 gene mutation [36-38]. Together with the life style and fertility factors, the combined risk is greatly increased.

National Health System (Government):

The national Government of PNG through the health department adopted the national health plan for year 2010 to 2020. Key Result Area 7 states "Promote healthy lifestyles and reduce morbidity and mortality from non-communicable diseases such as cancer" [39]. The policy emphasis is on the need for primary and preventive health care. Therefore there is less allocation of resources to the secondary and tertiary care of cancer in general. Funds allocated for cancer promotion and services are minimal that even the only

radiation cobalt machine in the country has been nonfunctional and has not been attended to for the past five years. There was a long period from late eighties to the year 2005 where the same machine was idle without any use. Medications are infrequently supplied to hospitals and surgery may even take a longer time.

There are about eight pathologists working in the main tertiary hospital (i.e. Port Moresby General Hospital) servicing about eight million populations. All pathological specimens are often screened here by these specialists and most often it gets massively tedious. This type of cancer services is typical for any developing or low income country in the Pacific, excluding Australia and New Zealand.

Breast cancer screening:

Mammography is limited to a lot of low to medium income countries, [40] and where there is availability; its superiority to clinical examination in screening for breast cancer is known [41]. In least developed countries, Self-breast examination and its awareness among women is highly encouraged and continue to be maintained as the best screening option. Self-breast examination is cheap, practical and can be done at home situation. In addition more women must be encouraged to seek early help at the health facility [43, 44].

Management of breast cancer:

Management of breast cancer and any other cancer in PNG and the Pacific Islands countries are always suboptimal. Poor resources for cancer services and patients' dynamics have together resulted in extremely poor outcomes. Therefore about 70% of deaths from cancer occur in low-middle income countries [2] and the

Global burden of cancer is now occurring in these countries [44].

Ideal management of breast cancer requires a multidisciplinary team, comprising the breast surgeon (mostly general surgeon in the Pacific Islands), radiologist, pathologist, radiation and medical oncologists, and a breast care nurse. It also depends on a robust and equitable health care system, with adequate staffing and resources to provide optimal treatments [2]. Most if not all are wishful items for most Pacific Island countries. While the management of cancer is not straight forward in most countries, understanding the cancer biology, public

health awareness, socio-cultural and lifestyle adjustment are but feasible and easier to manage [45].

Summary facts about cancer care in PNG and the Pacific Island countries:

Managing a cancer patient in a resource limited country like PNG, one needs to understand basic but very important facts about the dynamics involved in the care [15, 40,46]. The list below shows variables that are generally common for PNG and other small Pacific Island countries and forms the main core of the public awareness.

Variables
Early detection
Access to optimal treatment
Inadequate diagnostic facility and treatment
Lack of education and awareness
Geographical isolation
Competing health care needs
Traditional remedy
Cultural and economic factors may hinder the survival outcome; for example: misunderstanding about the disease process like surgery may help spread the diseases quickly and may cause death too soon
Other social implications such as negative perception that post mastectomy burden to family can cause reluctance, fear and denial for further treatment

Most scores with negatives on the list will always result in delayed presentation, advanced disease stage with large tumors and invariant histology grading, local and regional lymph nodes involvement are common and distant metastasis [40,47].

These are typical features for PNG and Pacific Islanders.

International Programs:

The World Health Organization (WHO) [48], International Agency for Research on Cancer (IARC) [49] and International Association for Cancer Registries(IACR)

[50] together aim to unify the cancer registration for cancer patients throughout the world. Such programs will promote uniformity of data and monitoring of cancer patients throughout the region. Although in PNG a cancer registry started in 1958, it has never continued. Cancer management is adhoc and data are never standardized. Meetings to rectify these have been ongoing and the establishment should take priority.

Other pacific islands have their central registry in Suva, Fiji. Data is kept there and coordination is done through the central registry. Recently it has an ongoing program supported by the international body and foreign aid from Australia and New Zealand.

The Breast Health Global Initiative [51] was set up in 2003 by the Fred Hutchinson Cancer Centre in Seattle, USA. The aim was to develop economically feasible and culturally sensitive guidelines for breast cancer care in low and middle-income countries. These guidelines cover the whole spectrum of breast cancer control (prevention, early detection, diagnosis and treatment).

The guidelines are feasible and convenient and are stratified into four (4) types: basic, limited, enhanced and maximal segments depending on their sources that are available. The aim of this stratification model is to ensure in low resource settings, that women with breast cancer are

managed appropriately [52, 53]. However, such initiatives may not achieve its primary objective if local data collections and data recording are not done. This is one of the biggest obstacles in cancer care in PNG and the Pacific Island countries [54]. Many such projects initiated and funded by international organizations for the betterment of the local cancer population can only survive and serve its purpose when the local host country takes ownership of the program. Despite many obstacles and local programs in disarray, there are always challenges in PNG and the Pacific countries to provide optimum care for the breast cancer patients. Otherwise many of these low to middle income countries will continue to provide the burden to the global cancer care programs.

CONCLUSION:

Care of breast cancer and other cancers in PNG and the Pacific Island countries have their own unique challenges and the same cannot be said for other developed countries within the region. However, it requires taking ownership of the programs, simple but effective awareness about the public health and lifestyle and in addition, early and basic regular health checks are important to decrease risk of cancer in our communities.

REFERENCES:

1. Torre LA, Bray F, Siegel RL, Ferlay J, Lortet-Tieulent J, Jemal A. Global Cancer Statistics, 2012. *Ca Cancer J Clin.* 2015; 65: 87-108.
2. Cancer Today. All cancers. GLOBOCAN 2018, Global Cancer Observatory, IARC, WHO. www.gco.iarc.fr/today/data/factsheets/cancers/39-All-cancers-factsheet.pdf.
3. CDC. Breast Cancer. 2017 www.cdc.gov/cancer/breast/basic_info/what-is-breast-cancer.htm.
4. Cancer Today. Breast Cancer. GLOBOCAN 2018, Global Cancer

- Observatory, IARC, WHO.
www.gco.iarc.fr/today/data/factsheets/cancers/20-breast-factsheet.pdf
5. Sengupta SK, Bukenya GB, Murthy DP. Breast cancer in Papua New Guinea: a survey of 10 years. *Aust NZJ Surg*. 1990 Jan;60(1):41-4.
 6. Halder A, Morewaya J, Watters DA. Rising incidence of breast cancer in Papua New Guinea. *ANZ J Surg*. 2001; 71(10): 590-3.
 7. Waine A, Keith P, Waine SE, Taufa S, John LN. A Prospective Study on Breast Cancer in Surgical Department of Port Moresby General Hospital, a Tertiary Care Hospital in Papua New Guinea. *Journal of Global Oncology*. 2016; 3_suppl; 57s. DOI:10.1200/JGO.2016.004382
 8. Crouch –Chivers PR: A review of Cancer in Papua New Guinea. *PNG Medical Journal* 2010 Mar-Jun;53 (1-2):48-53
 9. Foliaki S, Best D, Akau'ola S, Cheng S, Borman B, Pearce N. Cancer Incidence in four Pacific Countries: Tonga, Fiji Islands, Cook Islands, Niue. *Pacific Health Dialog*, March 2011, Vol. 17, No1:21-32
 10. Shin HR, Joubert C, Boniol M, Hery C, Ahn SH, Won YJ, et al. Recent trends and patterns in breast cancer incidence among Eastern and Southeastern Asian women. *Cancer Causes Control* 2010;21:1777-1785
 11. Park S, Bae J, Nam BH, Yoo KY. Aetiology of cancer in Asia. *Asian Pac J Cancer Prev* 2008;9:371-380.
 12. Porter P. "Westernizing" women's risks? Breast cancer in lower income countries. *N Engl J Med* 2008;358:213-216.
 13. Afolabi IR. Towards prevention of breast cancer in the Pacific: influence of diet and lifestyle. *Pac Health Dialog* 2007;14:67-70.
 14. Lertkhachonsuk AA, Yip CH, Khuhaprema T, Chen DS, Plummer M, Jee SH, Toi M, Wilailak S. Cancer prevention in Asia: resource-stratified guidelines from the Asian Oncology Summit 2013. *Lancet Oncol* 2013;14:e497-507.
 15. Green M, Raina V. Epidemiology, screening and diagnosis of breast cancer in the Asia–Pacific region: Current perspectives and important considerations. *Asia-Pacific Journal of Clinical Oncology* 2008;4:S5-S13.
 16. Kuska B. Breast cancer increases in Papua New Guinea. *Journal of the National Cancer Institute*. 1999; 91(12): 994-996. <https://doi.org/10.1093/jnci/91.12.994>
 17. Key TJ, Verkasalo PK, Banks E. Epidemiology of breast cancer. *Lancet Oncol* 2001; 2: 133-140.
 18. Parsa P, Parsa B. Effects of reproductive factors on risk of breast cancer: a literature review. *Asian Pac J Cancer Prev* 2009;10:545-550.
 19. Nagata C, Hu YH, Shimizu H. Effects of menstrual and reproductive factors on the risk of breast cancer: meta-analysis of the case-control studies in Japan. *Jpn J Cancer Res* 1995;86:910-915.

20. Suh JS, Yoo KY, Kwon OJ, Yun IJ, Han SH, Noh DY, Choe KJ. Menstrual and reproductive factors related to the risk of breast cancer in Korea. Ovarian hormone effect on breast cancer. *JKorean Med Sci* 1996; 11:501-508.
21. Gao YT, Shu XO, Dai Q, Potter JD, Brinton LA, Wen W, Sellers TA, Kushi LH, Ruan Z, Bostick RM, Jin F, Zheng W. Association of menstrual and reproductive factors with breast cancer risk: results from the Shanghai Breast Cancer Study. *Int J Cancer* 2000;87:295-300.
22. Liu YT, Gao CM, Ding JH, Li SP, Cao HX, Wu JZ, Tang JH, Qian Y, Tajima K. Physiological, reproductive factors and breast cancer risk in Jiangsu province of China. *Asian Pac Cancer Prev* 2011;12:787-790.
23. Yanhua C, Geater A, You J, Li L, Shaoqiang Z, Chongsuvivatwong V, Sriplung H. Reproductive variables and risk of breast malignant and benign tumors in Yunnan province, China. *Asian Pac J Cancer Prev* 2012;13:2179-2184.
24. Fan L, Zheng Y, Yu KD, Liu GY, Wu J, Lu JS, Shen KW, Shen ZZ, Shao ZM. Breast cancer in a transitional society over 18 years: trends and present status in Shanghai, China. *Breast Cancer Res Treat* 2009;117:409-416)
25. Pip A, Waters D, Murthy D, Wood N, Donnelly P. Hormone-receptor status of breast cancer in Papua New Guinea. *The Lancet*. 1998; 351(9112): 1328-1329. DOI: [https://doi.org/10.1016/S0140-6736\(05\)79054-1](https://doi.org/10.1016/S0140-6736(05)79054-1)
26. Leong SP, Shen ZZ, Liu TJ, Agarwal G, Tajima T, Paik NS, Sandelin K, Derossis A, Cody H, Foulkes WD. Is breast cancer the same disease in Asian and Western countries? *World J Surg* 2010;34: 2308-2324.
27. Yip CH, Pathy NB, Uiterwaal CS, Taib NA, Tan GH, Mun KS, Choo WY, Rhodes A. Factors affecting estrogen receptor status in a multiracial Asian country: an analysis of 3557 cases. *Breast* 2011;20 Suppl2:S60-64.)
28. WHO Global Status Report on non-communicable diseases 2014. World Health Organisation 2014. Geneva, Switzerland.
29. WHO Global Report. Mortality attributable to tobacco. Geneva: World Health Organisation; 2012. www.who.int/tobacco/publications/surveillance/rep_mortality-attributable/en/.
30. Benson JR et al. Early breast cancer. *The Lancet*. 2009; 373(9673): 1463-1479.
31. Allen NE, Beral V, Casabonne D, Kan SW, Reeves GK, Brown A, Green J: Moderate alcohol intake and cancer incidence in women. *J Natl Cancer Instit*. 2009; 101(5): 296-305.
32. IARC Monographs 100E. Consumption of alcohol. Lyon: International Agency for Research on Cancer; 2012. <http://monographs.iarc.fr/ENG/Monographs/vol100E/mono100E-11.pdf>.
33. Monninkhof E, Elias S, Vlems F, van der Tweel I, Schuit AJ,

- Voskuil DW, van Leeuwen FE. Physical activity and breast cancer: A systematic review. *Epidemiology*. 2007; 18(1): 137-157.
34. Global recommendations on physical activity for health. Geneva: World Health Organisation; 2010. http://whqlibdoc.who.int/publications/2010/9789241599979_eng.pdf.
35. Boyd NF, Guo H, Martin LJ, Sun L, Stone J, Fishell E, Jong RA, Hislop G, Chiarelli A, Minkin S, Yaffe MJ. Mammographic density and the risk and detection of breast cancer. *New England Journal of Medicine*. 2007; 356: 227-236.
36. Bhoo-Pathy N, Yip CH, Hartman M, Uiterwaal CS, Devi BC, Peeters PH, Taib NA, van Gils CH, Verkooijen HM. Breast cancer research in Asia: adopt or adapt Western knowledge? *Eur J Cancer* 2013;49:703-709.
37. Park SK, Kim Y, Kang D, Jung EJ, Yoo KY. Risk factors and control strategies for the rapidly rising rate of breast cancer in Korea. *J Breast Cancer* 2011;14:79-87.
38. Sim X, Ali RA, Wedren S, Goh DL, Tan CS, Reilly M, Hall P, Chia KS. Ethnic differences in the time trend of female breast cancer incidence: Singapore, 1968-2002. *BMC Cancer* 2006;6:261
39. National Department of Health. National Health Plan. 2011-2020. Volume 1. Policies and Strategies. NDOH PNG. 2010.
40. Agarwal G, Pradeep PV, Aggarwal V, Yip CH, Cheung PS. Spectrum of breast cancer in Asian women. *World J Surg* 2007;31: 1031-1040.
41. Tan SM, Evans AJ, Lam TP, Cheung KL. How relevant is breast cancer screening in the Asia/Pacific region? *Breast* 2007;16:113-119.
42. Harford JB. Breast-cancer early detection in low-income and middle-income countries: do what you can versus one size fits all. *Lancet Oncol* 2011;12:306-312.
43. Yip CH, Taib NA. Challenges in the management of breast cancer in low and middle-income countries. *Future Oncol* 2012;8:1575-1583.
44. Jemal A, Bray F, Center MM, Ferlay J, Ward E, Forman D. Global Cancer Statistics. *Ca Cancer J Clin* 2011; 61: 69-90.
45. Toi M, Ohashi Y, Seow A, Moriya T, Tse G, Sasano H, Park BW, Chow LW, Laudico AV, Yip CH, Ueno E, Ishiguro H, Bando H The Breast Cancer Working Group presentation was divided into three sections: the epidemiology, pathology and treatment of breast cancer. *Jpn J Clin Oncol* 2010;40 Suppl1:i13-18.
46. Yip CH. Breast Cancer in Asia. In: Verma M. eds. *Methods in Molecular Biology, Cancer Epidemiology*, Vol 471. Totowa, NJ: Springer Science; 2009:51-64.
47. Yip CH, Taib NA, Mohamed I. Epidemiology of breast cancer in Malaysia. *Asian Pac J Cancer Prev* 2006;7:369-374.63.
48. World Health Organisation. www.who.int
49. International Agency for Research on Cancer. www.iarc.fr

50. International Association for Cancer Registries. www.iacr.com.fr
51. Breast Health Global Initiative. www.fredhutch.org
52. Anderson BO, Braun S, Carlson RW, Gralow JR, LagiosMD, Lehman C, Schwartzmann G, Vargas HI. Overview of breast health care guidelines for countries with limited resources. *Breast J* 2003;9 Suppl2:S42-50.
53. Anderson BO, Shyyan R, Eniu A, Smith RA, Yip CH, Bese NS, Chow LW, Masood S, Ramsey SD, Carlson RW. Breast cancer in limited-resource countries: an overview of the Breast Health Global Initiative 2005 guidelines. *Breast J* 2006;12Suppl 1:S3-15.
54. Anderson BO, Cazap E, El Saghir NS, Yip CH, KhaledHM, Otero IV, Adebamowo CA, Badwe RA, Harford JB. Optimisation of breast cancer management in low resource and middle-resource countries: executive summary of the Breast Health Global Initiative consensus, 2010. *Lancet Oncol.* 2011;12:387-398.

ASSESSMENT OF ANTIBIOTICS PRESCRIBED TO PATIENTS WITH PERIPHERAL LYMPHADENOPATHY REFERRED FOR FINE NEEDLE ASPIRATION BIOPSY AT PORT MORESBY GENERAL HOSPITAL, PAPUA NEW GUINEA

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Runny title: Use of antibiotics amongst patients with peripheral lymphadenopathy

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ABSTRACT:

The pattern of antibiotics prescribed to patients with peripheral lymphadenopathy was assessed and compared with existing standard treatment guidelines (STGs) manual in Papua New Guinea (PNG). Information was obtained from patients referred to the Port Moresby General Hospital (PMGH) for fine needle aspiration biopsy by interviewing patients and reviewing patients' clinic attendance record books and referral letters. Of the 107 patients recruited for the study, 51 (47.7%) were prescribed antibiotics. Prescription data was obtained from 40 (78.4%) of the 51 patients. Amoxicillin which is recommended as a first line antibiotic for peripheral lymphadenopathy in PNG STGs was the preferred antibiotic by 18 (45.0%) of the 40 prescribers. There was high variability in the second line antibiotic selection, antibiotic combinations and treatment duration. The results highlight the need for on-going training on rational antibiotic prescribing by prescribers in Port Moresby.

Keywords: peripheral lymphadenopathy, Papua New Guinea, antibiotic prescribing, standard treatment guidelines

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INTRODUCTION:

Peripheral lymphadenopathy is a common presentation at the primary healthcare setting and in most cases careful clinical examination reveals the primary pathology. The pathological

causes are determined by disease epidemiology varying between tropical and non-tropical countries as well as between children and adults [1 – 5]. Mycobacterium tuberculosis infection (MTB) is a common

cause for peripheral lymph node enlargement in Papua New Guinea (PNG) where MTB is endemic [6,7] but lymph node enlargement can also be caused by skin infections, lymphoma, sexually transmitted infections (STIs) and dental infections [8,9]. The common causes for peripheral lymphadenopathy amongst children in PNG include acute infections, tuberculosis and malignancy [8]. In adults the frequent causes are MTB, Human Immunodeficiency Infection (HIV), skin or other soft tissue infections, filariasis, STIs, lymphoma and other malignancies [9]. In non-tropical countries acute viral infections and malignancies are a frequent cause for peripheral lymphadenopathy [5,10,11].

Empirical antibiotic treatment of peripheral lymphadenopathy is guided by local epidemiology of diseases. In PNG standard treatment guidelines (STGs) have been published to guide primary healthcare workers [8,9]. The guidelines are aimed at assisting primary healthcare workers (Community Health Workers, Nurses, Health Extension Officers) to treat common conditions before referral to a physician for further evaluation [12]. Although the STGs are widely used by primary healthcare workers in PNG [13,14], Joshua et al [14] assessed the appropriateness of prescribing medicine using PNG STG and found inappropriate prescribing to be 39.9% in children and 33.4% in adults involving both drug selection and dosage. The study also

showed Amoxicillin was the common medicine prescribed across the three health facilities studied [14]. An observation by Samiak and Vince [13] also showed that 77% of health workers in urban clinics and rural health centres in PNG used the paediatric STGs for all conditions but only 51% followed the guidelines.

Despite increased antibiotic resistance there is a rise in global antibiotic consumption. Klein et al [15] examined the pharmaceutical sales data of 76 countries and showed the antibiotic consumption (defined daily doses, DDD) increased by 65% and antibiotic consumption rate (DDD per 1000 inhabitants) increased by 39% between 2000 and 2015. More importantly, the rise was driven by low- and middle-income countries (LMICs) where there was a 114% increase between 2000 and 2015 [15,16]. However, Abat et al [16] have argued that the increased antibiotic consumption in LMICs can be justified because the highest burden of infectious diseases is in these countries although antibiotics must be used with care. Laing et al [17] reviewed interventions proven effective in guiding medicine use in developing countries and listed 10 recommendations; one of these recommendations is the use of STGs. Standardising treatment approaches for infectious diseases also promotes judicious antibiotic prescription which reduces antibiotic resistance [17,18]. In PNG the paediatric STGs

have been in use throughout the health facilities for over 30 years and currently the manual is in its tenth edition [19,8]. The PNG Adult STG manual was last updated in 2012 and is in its sixth edition [9]. This paper describes the pattern of antibiotics prescribed to patients with peripheral lymphadenopathy referred to Port Moresby General Hospital (PMGH) for fine needle aspiration biopsy(FNAB). The observed prescribing patterns were also compared with the existing guidelines in the PNG STGs manual.

PATIENTS AND METHODS:

PMGH is the only tertiary referral hospital in PNG and is also the teaching hospital for the University of Papua New Guinea (UPNG) School of Medicine and Health Sciences (SMHS). It also serves as the referral hospital serving primary healthcare clinics and small private clinics in the National Capital District (NCD) in Port Moresby, PNG's capital city. The PMGH Pathology Department conducts FNAB clinics three times a week and processes patients referred for investigation. It is the only routine FNAB clinic within a public health facility in PNG.

Within the framework of a pilot project comparing diagnostic performance of the GeneXpert® tuberculosis system and microscopy in diagnosing tuberculous lymphadenitis [7], information on antibiotic use was obtained from patients referred for FNAB between November 2014 and August 2015.

The patients were recruited during one clinic day every week. Every third consecutive patient was selected. Both in-patients and out-patients with peripheral lymphadenopathy referred for FNAB were eligible for participation in the study. Verbal and written consent were requested from each of the selected patients or parents of children. Eligible consenting patients were clinically examined and interviewed using a pre-tested questionnaire. Basic demographic data, clinical history, site of lymphadenopathy and information on antibiotic prescribed were recorded. Patients' clinic attendance books and the referral letters were also reviewed and antibiotic name(s), dosage, frequency and treatment duration were recorded. Following accepted clinical practice in PNG, the paediatric population was defined as equal to or below 13 years of age and adult population as 14 years of age or above.

Ethical clearance and approval were obtained from the UPNGSMHS Research and Ethics Committee and from the PNG National Department of Health Medical Research Advisory Council (NDOH MRAC File No 54-6-2). The data obtained were tabulated in Microsoft Excel and analysed using the Excel data pack.

RESULTS:

Total of 1080 patients attended the PMGH FNAB clinic during the study period and information was obtained from 107 (9.9%) consenting eligible subjects.

Referring health facility:

A total of 13 health facilities were included in this study. Gerehu hospital had the highest referrals (29.9%) followed by referrals from PMGH wards (23.4%) and PMGH tuberculosis clinic (TBC) (11.2%). The other 10 referrals were from primary healthcare clinics and private practitioners (Table 1).

Demographic data:

Of the 107 patients there were 45 (42.1%) males and 62 (57.9%) females. Further analysis shows that there were 24 (22.4%) children, age range 1.9-13 years with mean age of 7.7 ± 3.2 years and 83 adults, age range 16-70 years with mean age 31.5 ± 11.7 years.

Duration of lymphadenopathy:

Among the 107 patients 58 (54.2%) had lymph node swelling for six months, 33 (30.8%) had lymph node swelling for more than six months before seeking medical attention and 16 (15.0%) presented to the clinic less than one month after lymph node enlargement.

Site of lymphadenopathy:

Cervical region was the commonly involved site among 88 (82.2%) patients, followed by inguinal among 7 (6.5%) patients, submandibular region among 3 (2.8%) patients. Other sites were axillary in 2 (1.9%) patients, preauricular in 2 (1.9%), supraclavicular in 2 (1.9%) and submental region also in 2 (1.9%)

patients. One (0.9%) patient had a lump over the lumba-sacral region.

Antibiotic prescription pattern:

Among the 107 patients 51 (47.7%) had history of antibiotic use while 56 (52.3%) had no previous history of antibiotic use. Of the 51 patients given antibiotics, 11 (21.6%) revealed that they took antibiotics but there was no record in their clinic attendance books, the referral letter nor could they recall the name of the antibiotic they had taken. Hence, information on prescription pattern was obtained from 40 (78.4%) of the 51 patients. All 40 patients had antibiotic name recorded but dosage and frequency were not recorded in all of them. Only eight (20.0%) of the 40 patients had treatment duration recorded; of these, five days was the shortest antibiotic course (Co-trimoxazole 1 patient, Amoxicillin 2 patients, Erythromycin 1 patient), and two weeks was the longest treatment course (Chloramphenicol 1 patient). Two patients were on antibiotics for one week (Cefaclor, 1 patient, Chloramphenicol 1 patient) and one patient for 10 days (Chloramphenicol). Treatment duration was not obtained for 32 (80.0%) of the 40 patients.

Amoxicillin was the most common antibiotic prescribed (18/40; 45.0%), followed by Chloramphenicol (11/40; 27.5%), Co-trimoxazole (5/40; 12.5%), Flucloxacillin (3/40; 7.5%), Erythromycin (3/40; 7.5%), Cefaclor (2/40; 5%), Doxycycline (1/40; 2.5%) and Tinidazole (1/40; 2.5%). One patient was

commenced on tuberculosis treatment and referred for FNAB. Three patients (3/40, 7.5%) were prescribed two different antibiotics at the same time (Amoxicillin and Chloramphenicol, Chloramphenicol and Co-trimoxazole, Cefaclor

and Tinidazole). Two patients were prescribed Amoxicillin initially and later prescribed Chloramphenicol after the completion of the initial treatment.

Table 1: Referring health facilities with number of referrals

REFERRING HEALTH FACILITIES	N (%)
Gerehu Hospital	32 (29.9)
PMGH wards	25 (23.4)
PMGH TBC	12 (11.2)
Six Mile PHC	9 (8.4)
Kaugere PHC	5 (4.7)
Badili PHC	4 (3.7)
Lawes Road PHC	4 (3.7)
Tokarara PHC	4 (3.7)
Kilakila PHC	3 (2.8)
Outside NCD	3 (2.8)
Private GP	3 (2.8)
PMGH specialist clinics	2 (1.9)
Nine Mile PHC	1 (1.0)
Total	107 (100)

TBC = TB clinic, PHC = primary healthcare clinic, NCD = National Capital District, GP = general practitioner

DISCUSSION:

Evaluation of peripheral lymphadenopathy begins with detailed clinical history and careful physical examination and in most cases the primary pathology is usually identified from the clinical history and physical examination [20,21,10,11,5]. The history should contain age of the patient, onset and duration of lymphadenopathy, associated symptoms, drug history, occupation, place of residence and possible environmental exposures, sexual

history, past medical history and family history.

The physical examination characterises the anatomical features of lymphadenopathy such as anatomical location of lymph node enlargement, size, localised or generalised, single or multiple nodes, mobile or fixed, feature of overlying skin indicating possible inflammation, tender or non-tender, general consistency and end with careful examination of the primary draining site. Acute onset of lymphadenopathy associated with fever and a

sore throat may indicate infections whereas slow progressive non-tender enlargement suggests possible malignancy [11]. Head and neck region is a common site for peripheral lymphadenopathy so a careful inspection of the scalp and oral cavity should be done. Inguinal lymph node enlargement may suggest STIs or malignancies [10,11,5] but the lower limbs including the toes and soles of the feet must be examined as well. An enlarged liver or spleen may suggest malignancy or chronic infections. The PNG paediatric STG outlines a clear and concise management approach to lymph node enlargement in PNG children and broadly categorises possible causes as acute infections, tuberculosis and malignancy [8]. It also recommends careful visual assessment of the mouth, teeth and ears for evidence of infection if there are enlarged neck glands [8]. The recommended initial antibiotic is Amoxicillin for two weeks but if cellulitis is present Cloxacillin is the antibiotic of choice for two weeks [8]. An added benefit is that the paediatric STG has drug dosages calculated and presented in tables making it easy for fast and easy reference. There is also a brief description on the characteristics of lymphadenopathy that may be used to differentiate tuberculosis from possible malignancy [8]. These features ensure that the PNG Paediatric STG is able to be used by the lowest cadre of health workers in rural health facilities in PNG [13] and reflects over 30 years of experience developing the STG [19].

Lymphadenopathy management guidelines in the PNG Adult STG has more details compared to the PNG Paediatric STGs [8,9]. The additional information reflects the primary intended users in PNG and these are Doctors and Health Extension Officers. Indications for referral for further evaluation are suspected malignancy, no improvement after initial treatment and bleeding tendencies [8,9]. A notable difference between the adult and paediatric STGs is that the PNG Adult STG does not give antibiotic options. It is left to the health worker to make the appropriate antibiotic selection after identifying the primary pathology. The PNG Adult STG however, is more specific in the pathology investigation options, one of which is FNAB, an element missing in the paediatric STGs [8,9].

The results of this study demonstrate that the PNG STGs are useful in choosing initial antibiotic to treat patients with enlarged lymph nodes as indicated by Amoxicillin being the most common first choice antibiotic. It usually takes over one month for most patients to present to clinics in Port Moresby and this may reflect a lack of awareness among the public that MTB can start as a lymph node swelling. There may also be other barriers to accessing primary healthcare services in Port Moresby that need further investigation. Although Cloxacillin is mentioned as a second option antibiotic choice in the PNG Paediatric STG, only three patients were given this medicine, of which two had associated cellulitis. The other

antibiotics that were prescribed are not recommended in the STGs. Knowledge about local antibiotic susceptibility patterns are useful in deciding antibiotic choice but in PNG such data is scanty because of poor microbiology laboratory infrastructure [7]. A recent study done in Kundiawa hospital showed 79% of children from the community that had no prior history of antibiotic use and were diagnosed with osteomyelitis had Methicillin-Resistant *Staphylococcus Aureus* (MRSA) suggesting community acquired MRSA [22]; indicating the need for on-going antibiotic susceptibility testing surveillance in PNG. Inappropriate use of antibiotics is increasing in developing countries [23,17] and this practice has been noted in PNG as well [22]. Although antibiotics recommended in PNG STGs are also influenced by cost of medicine, cadre of health worker prescribing, clinical experience and accessibility to the drug; future STGs revisions need to consider the drug susceptibility pattern of the local area. The wide choice of antibiotics prescribed with varying combinations is a cause for concern and highlights a need for on-going training of healthcare workers on the use of STGs and rational antibiotic prescribing in PNG.

CONCLUSIONS:

Amoxicillin appears to be a preferred first choice antibiotic for patients with peripheral lymphadenopathy by healthcare workers at primary healthcare clinics in Port Moresby.

However, there is high variability in the second line antibiotic selection, antibiotic combinations and treatment duration. The results highlight the need for on-going training on the use of STGs in PNG and rational antibiotic prescribing.

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REFERENCES:

1. Mohan A, Reddy MK, Phaneendra BV, Chandra A. Aetiology of peripheral lymphadenopathy in adults: Analysis of 1724 cases seen at a tertiary care teaching hospital in southern India. *Natl Med J India*. 2007;20:78-80.
2. Olu-Eddo AN, Ohanaka CE. Peripheral Lymphadenopathy in Nigerian adults. *JPakMed Assoc*. 2006;56(9):405-408.
3. Moore SW, Schneider JW and HS Schaaf. Diagnostic aspects of cervical lymphadenopathy in children in the developing world: a study of 1,877 surgical specimens. *PediatrSurg Int*. 2003;19(4):240-244.
4. Richner S, Laifer G. Peripheral lymphadenopathy in immunocompetent Adults. *Swiss Med Wkly*. 2010;140(7-8):98-104.
5. Oguz A, Karadeniz C, Temel EA, Citak EC, F. Okur FV. Evaluation of peripheral lymphadenopathy in children. *PediatrHematol Oncol*. 2006;23(7):549-561. DOI: 10.1080/08880010600856907.
6. McMaster P, Ezeilo N and JD Vince. A retrospective review of paediatric lymph node tuberculosis in Port Moresby, Papua

- New Guinea. *Ann Trop Paediatr* 2000;20(3):223-226.
7. Itaki R, Bannick F, Lavu E, Joseph J, Magaye R, Banamu J, Johnson K, Welch J. Drug susceptibility pattern of mycobacterium tuberculosis isolates from patients undergoing fine needle aspiration biopsy at Port Moresby General Hospital, Papua New Guinea. *PacJMedSci*. 2016;15(2):26-33.
 8. Standard Treatment for Common Illnesses of Children in Papua New Guinea. A Manual for Nurses, Community Health Workers, Health Extension Officers and Doctors. Paediatric Society of Papua New Guinea. 10thEd. 2016.
 9. Standard Treatment Guidelines for Adults. Papua New Guinea National Department of Health. 6th Ed. 2012.
 10. Ferrer R. Lymphadenopathy: differential diagnosis and evaluation. *Am Fam Physician*.1998;56(6):1313-1320.
 11. Gaddey HL, Riegel AM. Unexplained Lymphadenopathy: Evaluation and Differential Diagnosis. *Am Fam Physician*. 2016;94(11):896-903.
 12. Joshua IB, Passmore PR, Bruce Sunderland VB. An evaluation of the Essential Medicines List, Standard Treatment Guidelines and prescribing restrictions, as an integrated strategy to enhance quality, efficacy and safety of and improve access to essential medicines in Papua New Guinea. *Health Policy Plan*. 2016;31(4):538-546.
 13. Samiak L, Vince JD. The use of the Paediatric Standard Treatment Book by clinic and health centre staff. *PNG Med J*. 2000;43(1-2):69-75.
 14. Joshua IB, Passmore PR, Parsons R, Bruce Sunderland VB. Appropriateness of prescribing in selected healthcare facilities in Papua New Guinea. *Health Policy Plan*. 2014;29(2):257-265.
 15. Klein EY, Van Boeckel TP, Martinez EM, Pant S, Gandra S, Levin SA, Goossens H, Laxminarayan R. Global increase and geographic convergence in antibiotic consumption between 2000 and 2015. *Proc NatlAcad Sci USA*. 2018;115(15):E3463-E3470.DOI: 10.1073/pnas.1717295115.
 16. Abat C, Gautret P, Raoult D. Benefits of antibiotics burden in low-income countries. *Proc NatlAcad Sci USA*. 2018;115(35): E8109-E8110. DOI:10.1073/pnas.1809354115.
 17. Laing RO, Hogerzeil HV, Ross-Denan. Ten recommendations to improve use of medicines in developing countries. *Health Policy Plan*.2001;16(1):13-20.
 18. Istúriz RE, Carbon C. Antibiotic Use in Developing Countries. *Infect Control Hosp Epidemiol*. 2000;21(6):394–397.
 19. Vince JD, Mokela D. Thirty years of the Paediatric Standard Treatment Book. *PNG Med J*. 2006;49(3-4):147-155.
 20. Friedmann AM. Evaluation and Management of Lymphadenopathy in Children. *Pediatr Rev*. 2008;29:53-60. DOI: 10.1542/pir.29-2-53.
 21. Mohseni S, Shojaiefard A, Khorgami Z, Alinejad S, Ghorbani A, Ghafouri A. Peripheral Lymphadenopathy: Approach and Diagnostic Tools. *Iran JMed Sci*. 2014;39(2):158-170.
 22. Aglua I, Jaworski J, Drekore J, Urakoko B, Poka H, Michael A, Greenhill A. Methicillin-Resistant *Staphylococcus Aureus* in Melanesian Children with Haematogenous Osteomyelitis from the Central Highlands of Papua New Guinea. *Int J Pediatr*. 2018;6(10):8361-8370. DOI: 10.22038/ijp.2018.31279.2763.
 23. Ibeawuchi R, Mbata T. Rational and irrational use of antibiotics. *Africa Health*. 2002;24(2):16-18.

EXPLORING THE RELATIONSHIP BETWEEN AGE OF ONSET OF LEARNING ENGLISH AND STUDENT ACADEMIC PERFORMANCE: EVIDENCE FROM PAPA NEW GUINEA

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ABSTRACT:

This paper is a follow-up on our 2017 study of the effect of Age of Onset of learning English (AO) on the academic performance of University of Papua New Guinea (UPNG) students in the School of Humanities and Social Sciences (SHSS). It investigates the relationship between three factors in the students' Early Language Education {Age of Onset of learning English (AO), Age at Literacy (AGELIT), and Early Learning Language (ELL)} and the students' academic performance, measured by their current Grade Points Average (GPA). A survey of SHSS students registered in the second Semester of the 2018 academic year was conducted using purposive cross-sectional sampling method. A self-designed pretested questionnaire yielded data on the students' language education backgrounds (their AO, AGELIT and ELL). Linear regression and correlation analyses revealed a strong and statistically significant inverse correlation between students' AO/AGELIT and their GPAs. In addition, a strong positive link was observed between ELL English and the students' GPAs. Relatively lower GPAs were associated with ELL Vernacular, and a highly significant decrease in GPAs was observed in the presence of ELL Tok Pisin. These results corroborate the findings of all our earlier studies, which established a highly significant negative correlation between students' AO and their academic performance at UPNG, as well as in all six National High Schools of Papua New Guinea.

Keywords: Second Language Acquisition (SLA), brain maturation, myelination, language education policy, Early Learning Language (ELL), Age of Onset (AO), Age of Literacy (AGELIT).

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INTRODUCTION:

English is the language of education in Papua New Guinea (PNG). In this context, the controversial issue of Age of Onset (AO) of learning English goes beyond academic debates over the techniques and methods of teaching a second language; in this country, AO has

acquired vital significance, because delayed AO has been associated with lower academic proficiency among High School and university students [1 - 3].

Recent advances in neuroscience have deepened our understanding of the biological foundations of language, particularly with regard

to the Critical Period Hypothesis (CPH), first postulated by Penfield [4] and Lenneberg [5]. New functional Magnetic Resonance Imaging (fMRI) technologies have been used to track brain development in real time, mapping brain anatomy to brain function. Language processing and speech production require efficient connectivity between separate and distinct regions of the brain which are not connected at birth. Imaging technologies have now revealed the genesis and development of the biological “language circuit” during post-natal brain maturation in response to environmental stimuli [6 - 11]. While the existence of CPH effects in First Language Acquisition (FLA) is generally accepted, the idea of age-related constraints in Second Language Acquisition (SLA) is still vociferously disputed by some SLA/TESOL (Teaching English to Speakers of Other Languages) professionals [12 - 17], Summer Institute of Linguistics (SIL) [18 - 20], as well as by researchers in the National Research Institute (NRI), PNG [21]. Their position is understandable, in the context of the still common social attitudes rooted in the social constructionism of the 20th century. Skepticism with regard to CPH effects extending to SLA is also prevalent up until now in many influential international organizations, such as the United Nations Educational, Scientific and Cultural Organization (UNESCO), and some Non-Governmental Organizations (NGOs). UNESCO’s Mother Tongue (MT) education policy, shaped at a time when our knowledge of

the biology of the Mind was very limited, has been actively promoted around the world since 1953 [22; 23]. Unfortunately, the MT education policy, built on the truism that children learn literacy more effectively in the language that they already speak, has overlooked the difference between European/ North American societies with historically established national languages and the relatively young multilingual developing societies with their own specific needs, logistics and socio-economic environments.

Most current reviews of age-related SLA research are critical of the notion that CPH effects extend to SLA, shifting focus instead to a ‘wide range of socio-affective and cognitive,’ as well as “input, contextual and individual factors” [24; 27].

Our research into the causes of low quality of education in PNG revealed a significant inverse correlation between three factors in students’ early language education backgrounds (AO, AGELIT and ELL other than English) and their academic proficiency at high school and university levels [1-3]. These findings and conclusions (that PNG children should be taught English/ literacy in English at the youngest possible age) have received a lot of pushback, both nationally and internationally.

This paper presents the findings of yet another investigation into the relationship between the age factor and students’ academic proficiency, this time in the School of Humanities and Social Sciences, UPNG.

Research questions & hypotheses:

The main objective of this study was to explore the possible causes of students' low academic proficiency in SHSS UPNG and suggest ways of raising the quality of education in UPNG. As in the 2017 study [2], our research questions addressed the relationship between the 'age factors' (AO and AGELIT), as well as ELL, in students' early language education backgrounds, and their current academic performance (GPA). Our null hypotheses assumed no relationship between these factors and the students' GPAs.

METHODOLOGY:

A survey, using purposive cross-sectional sampling method, was carried out in the SHSS UPNG during the second Semester of the 2018 academic year. All 1,063 full-time registered students in the SHSS were eligible to participate in the study. A self-designed pretested questionnaire yielded data on SHSS students' language education backgrounds, with details of their Age at Onset (AO) of learning English, Age at Literacy (AGELIT) and the Early Learning Language (ELL) in which they were taught literacy.

The survey questions were:

Which language(s) did you speak at home? How old were you when you learned to read and write? Where (in which province) did you do your elementary schooling? In what language did you learn to read and write? How old were you when you first started learning English?

Students' responses were entered into Excel spreadsheets, coded, and matched with their respective GPAs, forming our final dataset. The data set was imported into two statistical software programs, STATA 15 and SPSS 20, which were both used to conduct quantitative analysis. Descriptive statistics, comparison of means, correlation, linear regression, multiple regression and nonparametric analyses were performed, as appropriate.

Ethical clearance and permission for this study was obtained from the ethics committee in the SHSS UPNG.

Province Representation:

SHSS UPNG students come from various parts of the country. In PNG, there are four Regions (Highlands, Islands, MOMASE, and Papuan) made up of 22 provinces, including the Autonomous Region of Bougainville (AROB) and the National Capital District (NCD). Students from all the provinces are represented in the UPNG student population. UPNG, the Premier University in the South Pacific region, also has some foreign students, mainly from West Papua (Indonesian: Papua Barat), Solomon Islands and Samoa. Almost all the students received their elementary education in urban centers and townships scattered around the country. The three largest groups in our sample were from the NCD - 137 (21.0%), from Morobe - 73 (11.2%) and from Western Highlands Province (WHP) - 69 (10.6%).

RESULTS:

Of the 1,063 questionnaires distributed, 651 (61.2%) were completed and returned. The 38.8% non-response rate was due to survey time constraints, as well as to some logistical and administrative issues. Of the 651 responders, 281 (43.2%) were female, and 370 (56.8%) were male. The Gender Parity Index (GPI) was 0.759 (281/370).

Home Language (L1):

The home languages were: Tok Pisin (TP), Vernacular (V) and English (ENG).

The vast majority of students spoke Tok Pisin at home, but many were multilingual, speaking two, three, or even four languages (TP-V-ENG, TP-V or TP-ENG).

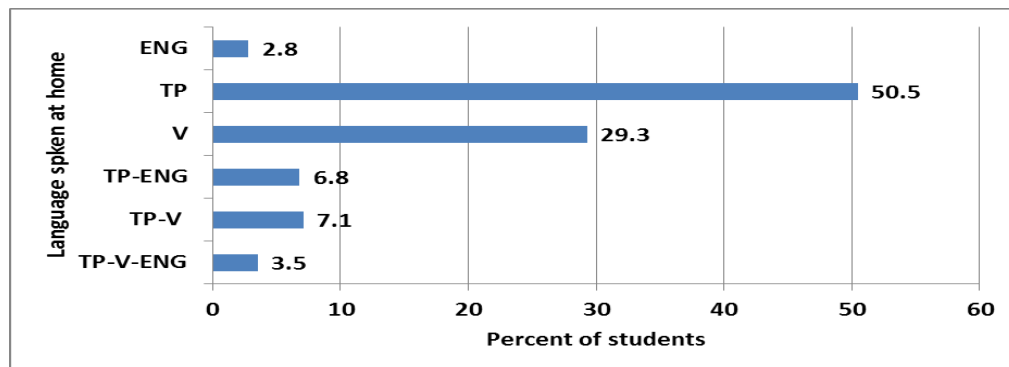


Fig. 1. Percent distribution of students according to Home Languages

The percent distribution of the students according to the language(s) spoken at home is presented in Fig. 1. Majority (329; 50.5%) of the 651 students spoke Tok Pisin at home, followed by 191 (29.3%) that spoke vernacular at home.

AO and AGELIT groups:

With regard to the Age of Onset of learning English (AO), the 651 students were separated into three age groups:

Early (AO: 1-5 years: 146 (22.4%) students who learned English before they started elementary school);

Normal (AO: 6-8 years): 370 (56.8%) students who learned English before adolescence;

Late (AO: 9-21 years): 135 (20.7%) students who were 9 or older when they first started learning English in school.

In regard to their age at literacy (AGELIT), the 651 students were also separated into three distinct AGELIT Groups: Early (4 – 5 years): 64

(9.8%) students; Normal (6 – 8 years): 430 (66.1%) students; Late (9 – 18 years): 157 (24.1%) students.

Both AO and AGELIT variables were used as continuous in our linear and multiple regression models, as per Vanhove's recommendations [28].

Early Learning Language (ELL):

Out of 651 students, 286 (43.9%) had done their elementary schooling in English; 69 (10.6%) were taught in Tok Pisin; 57 (8.8%) were taught in Vernacular; 224 (34.4%) were taught in a mixture of English and Tok Pisin, and 15 (2.3%) had been taught in both Vernacular and English (Fig. 2).

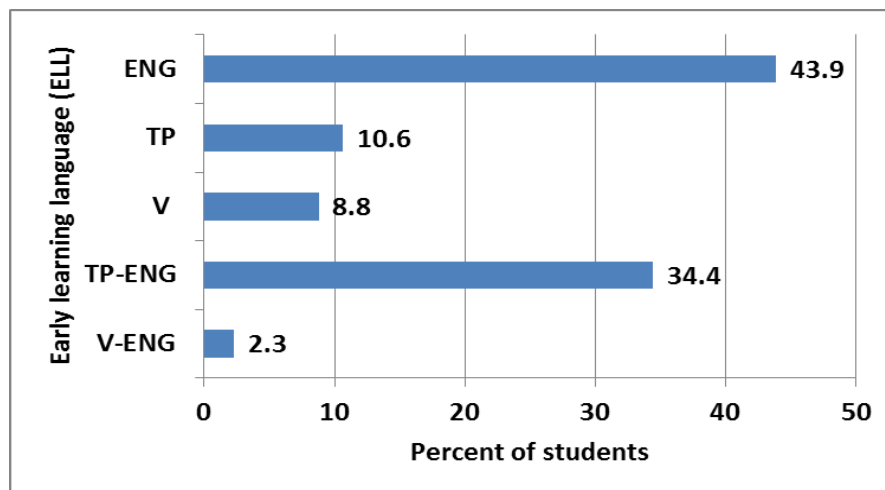


Fig. 2: Percent distribution of students according to their Early Learning Language (ELL)

Majority of the 651 students reported ELL English, followed by the second-largest group who were taught literacy in both English and Tok Pisin. The combined number of students with ELL English (ENG) and ELL English-Tok Pisin (ENG-TP) was 510 (78.3%).

Surprisingly few (141, 21.7%) students named ELL TP or ELL Vernacular/ELL Vernacular-English as the languages in which they were taught to read and write.

GPA variable: The mean GPA for all the 651 students that participated in this study was 2.48, the range was 4.8 to 0.25. The GPA results obtained were separated by gender. The results for the male and female students were not normally distributed. Thus, non-parametric statistics were used for analysis of the data. The 50th percentile GPA for both male and female students was 2.50; the Interquartile range (25th and 75th percentiles) was 2.00 to 3.00 for both groups. No statistically significant difference was

observed when both results were compared using the independent samples Mann-Whitney U and Wilcoxon tests ($p = 0.05$, 2-tailed). This was confirmed by the Kruskal-Wallis test ($p = 0.05$; 2-tailed) and Chi-square test.

However, mean GPAs varied widely amongst the AO Groups (AOGs): 50th percentile GPA for the three groups were 3.16, 2.50, and 1.67 for AOG1, AOG2, and AOG3, respectively. Median

GPA values were 3.00, 2.50, and 1.67 for AOG1, AOG2, and AOG3, respectively. The results for all three groups were not normally distributed.

Linear Regression analyses: Various linear regression models were used to examine the relationship between three factors (AO, AGELIT, and ELL) on the students' academic performance.

$$\text{Model 1: } GPA = \beta_1(AO) + \beta_2(AGELIT) + e_i$$

$$\text{Model 2: } GPA = \beta_1(AO) + \beta_2(AGELIT) + \delta_1(ELL) + e_i$$

$$\text{Model 3: } GPA = \beta_1(AO) + \beta_2(AGELIT) + \delta_1(ELL) + \beta_3(X') + e_i$$

Where e_i is an error term in our regression models, X' in Model 3 includes student level control variable (i.e., gender). The results obtained are presented in Table 1.

Table 1: Estimated coefficients from linear regression models

	Model 1	Model 2	Model 3
AO	-0.16***	-0.15***	-0.15***
AGELIT	-0.07**	-0.07***	-0.07**
ELL			
TP		-0.47***	-0.48***
V		0.07	0.05
ENG-TP		-0.26***	-0.25***
V-ENG		-0.21	-0.24
Gender			0.15***
_cons	4.07***	4.15***	4.12***
R Sq.	0.37	0.43	0.44
Adj. R Sq.	0.37	0.42	0.43
N	651	651	651
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$			

The relationship between the variables was negative and statistically significant for both AO and AGELIT, even after controlling for gender (as evident in Model 3). The effect of AO on student grade point average is double that of AGELIT. For instance, in model 3, a one year increase in AO reduces the GPA by 0.15 grade points,

whereas a one year increase in the AGELIT reduces the GPA by 0.07 grade points.

ELL is a categorical (dummy variable), so it has a level of each one of those variables that is taken as the reference level, and the model is adjusted taking into account these reference levels.

Therefore, to interpret the coefficients (i.e., -0.48 for ELL-TP), we can say that students with ELL Tok Pisin have a lower GPA by 0.48 grade points, compared to students with ELL English (the left-out category in the model). Similarly, students with ELL Tok Pisin-English have a lower GPA by 0.25 grade points, compared to students with ELL English.

Gender was the only statistically significant ($p < 0.1$) control variable which suggested that male students have a higher GPA by 0.15 grade points, compared to their female counterparts.

The R Squared regression coefficient was 0.44 ($R^2 = 0.44$); this means that AO, AGELIT and

ELL explain 44% of the variation in GPA, the dependent variable in our sample. Adjusted R Squared ($R^2 = 0.43$) indicates a medium effect size, according to Cohen's (1988) classification.

Correlations:

Nonparametric correlation analysis revealed a strong negative statistically significant relationship ($\rho = -0.60$, $p = 0.000$, 2-tailed) between the AO and GPA, and ($\rho = -0.54$, $p = 0.000$, 2-tailed) between the AGELIT and GPA (Table 2).

Table 2: Results of the non-parametric correlation analysis

	GPA	AO	AGELIT	ELL_ENG	ELL_TP	ELL_V	ELL_TPE	ELL_VE
GPA	1							
AO	-0.60*	1						
AGELIT	-0.54*	0.79*	1					
ELL_E	0.30*	-0.26*	-0.08*	1				
ELL_TP	-0.26*	0.19*	0.09*	-0.30*	1			
ELL_V	-0.04	0.28*	0.01	-0.28*	-0.03	1		
ELL_TPE	-0.11*	-0.03	0.01	-0.64*	-0.25*	-0.22	1	
ELL_VE	-0.04	0.04	0.01	-0.14*	-0.05*	-0.04	-0.11*	1

Table 3: Robustness check: Parametric correlation between AO & GPA, and AGELIT & GPA.

	GPA	AO	AGELIT	ELL_ENG	ELL_TP	ELL_V	ELL_TPE	ELL_VE
GPA	1							
AO	-0.64***	1						
AGELIT	-0.53***	0.71***	1					
ELL_E	0.32***	-0.31***	-0.15***	1				
ELL_TP	-0.29***	0.24***	0.14***	-0.30***	1			
ELL_V	-0.04	0.26***	0.04	-0.28***	-0.12**	1		
ELL_TPE	-0.12**	-0.00	0.04	-0.64***	-0.25***	-0.22***	1	
ELL_VE	-0.02	0.06	-0.00	-0.14***	-0.05	-0.05	-0.11**	1

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

As a robustness check, we conducted the Pearson correlation analysis of the data, which gave similar results as presented in Table 3.

Our regression and correlation results negate our null hypotheses, which states that AO, AGELIT, and ELL have no effect on students' GPA. Therefore, we reject our null hypotheses and accept the alternative hypotheses:

First H_1 = AO has a significant effect on students' GPAs.

Second H_1 = AGELIT has a significant effect on students' GPAs.

Third H_1 = ELL has a significant effect on students' GPAs.

DISCUSSION:

In line with our 2017 Study [3], the results obtained from the current investigation support the hypothesis that "AO has a significant negative effect on academic performance (GPA) of students in SHSS".

English proficiency is a prerequisite for comprehension of course content in all academic subjects taught at Primary, Secondary, and Tertiary levels of education. Therefore, if children have not acquired a certain level of proficiency in English before they enter Primary School, their academic performance will be compromised. According to recent studies [1-3], AO is one of the most powerful predictors of students' academic ability and overall performance at all post-elementary levels of education. The vast majority (78.3%) of the students in our present study started learning English before the age of 8

years, and the other 21.7% learned English at or after adolescence.

The mean GPA values across the three AO Groups (GPA 3.16 for Early AOG, GPA 2.51 for Normal AOG, and GPA 1.67 for Late AOG) clearly show the advantage of early AO.

Our results also strongly suggest that delayed exposure to English, mandated by the Vernacular Education policy which was implemented in PNG from the mid-1990s to 2013, may have negatively impacted PNG students' general academic potential, thus reducing the quality of education in the country. As was noted in an earlier study [2], the PNG Universal Basic Education (UBE) Syllabus implemented in 2015 offers only one hour of English learning per day (five hours per week) in the four years of Elementary school [29]. This, in our view, is 'too little, too late' for effective acquisition of English skills by students. Compounded by lack of qualified teachers, students' late AO results in a situation where most children in PNG start their Primary schooling at the pre-pubertal age of ten years or older, sorely lacking in English and literacy skills. Our results suggest that students will perform better, if they start learning English in pre-school, before the age of six years. There is a strong negative link between students' AO and their GPAs; therefore, the earlier students are taught English, the better they do at later stages of their education.

Our findings support the hypothesis that "an increase in AGELIT has a significant negative effect on students' academic performance (GPA)

in SHSS UPNG". There is a strong negative correlation between students' Age at Literacy (AGELIT) and their GPAs. English Literacy is the tool that students in PNG must use at all post-elementary levels of education. The Age factor impacts all aspects of language education; if children are not taught to read and write in early childhood, their learning potential is likely to decrease. Therefore, students will benefit most, if they acquire English literacy skills in Elementary Prep or earlier, before they start Primary school.

The earlier finding that "GPA distribution is not the same across categories of ELL" has also been corroborated by our results. Of the 651 students that participated in the present study, 78.3% had ELL English or ELL TP-English backgrounds, compared to 10.6% who received literacy education in Tok Pisin, and 11.1% who were taught in Vernacular and/or Vernacular-English. These figures indicate the relative ability of students with different ELL backgrounds to fulfil the selection criteria for tertiary education. The under-representation of ELL Vernacular students in the wake of the 'era' of Vernacular Education is indeed surprising - only 8.8% (57/651) of our sample had ELL Vernacular backgrounds. This could be explained by the lack of qualified teachers and teaching resources in Vernacular languages, as well as by the fact that many of the indigenous vernacular languages of PNG are still exclusively oral. ELL Tok Pisin background students (10.6%) had the lowest GPAs; the reasons for this should be further

investigated. It is clear, however, that students with English ELL performed significantly better than those with Tok Pisin ELL. Therefore, it is reasonable to conclude that children in Papua New Guinea should be taught to read and write in English, to enable them to cope with Primary school curriculum.

Despite the indisputable complexity and interrelatedness of the various socio-economic, historical and cultural factors affecting the quality of education in PNG, the negative effect of delayed AO of learning the national language of education – English – on students' academic proficiency and, ultimately, on the quality of education in PNG, cannot be overemphasized.

Currently, the PNG National Research Institute (NRI), as well as the Development Policy Centre, Australian National University (ANU) researchers blame the Tuition Fee-Free (TFF) policy for the fall in the quality of education in PNG [25; 26]. Undoubtedly, TFF policy opened the floodgates into the nation's classrooms, causing overcrowding and putting a tremendous stress on the already inadequate teaching resources and infrastructure. However, the solution to these problems is not in limiting access to education for those who cannot pay for it. Only increased investment in teacher training and school infrastructure development will improve the quality of education and produce the human resources the country needs. Without qualified personnel to run a modern economy, there can be no progress. Poor academic performance of students in the nation's schools and universities

translates, down the line, into shortage of quality human resources. This, in turn, impedes sustainable national development, for natural resources do not develop nations; quality *human* resources do.

The way to achieving national development goals is through optimizing the nation's language and education policy, in order to ensure that every child has the English skills required to cope with school curriculum before they commence formal schooling. Above all, an effective language education policy must be based on solid scientific knowledge of human brain development. In order to ensure optimal cognitive development of the growing minds, measures must also be taken to provide families with proper nutrition (and health care generally).

The emotional appeal of calls for MT education and linguistic /cultural preservation [30] must be balanced with a pragmatic assessment of Papua New Guinea's socio-economic needs in the 21st century.

CONCLUSIONS:

An increase in the age of onset of learning both English and literacy has been found to have a significant negative effect on SHSS UPNG students' academic performance. Students with ELL English backgrounds have significantly higher GPAs than those with ELL Tok Pisin. Students with ELL Vernacular backgrounds were under-represented in our sample.

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REFERENCES:

1. Temple O., Hane-Nou G., Kamene S. Ezebilo E. Effect of early language education on the academic performance of National High School (NHS) students in Papua New Guinea. *Language and Linguistics in Melanesia* Vol. 35, 2017 (pp. 177-198)
2. Temple O., C. Memehere, C. Mana, R. Saiyaipupu and J. Simon. Does the extent of myelination at the Age of Onset of second Language Acquisition (SLA) affect students' academic performance? A University of Papua New Guinea study. *Pacific Journal of Medical Sciences*, Vol. 18 No. 2, June 2018 (pp. 15-34)
3. Temple O., Kamene S., Guldun G., Maito M. Effect of Early Language Education on Students' Academic Performance: POMNATH case study. *Proceedings of the LSPNG 2016 International Conference in Ukarumpa, EHP PNG* (pp. 52-79)
4. Penfield W. and L Roberts. 1959. *Speech and Brain Mechanisms*. Princeton, 1959; Princeton University Press.
5. Lenneberg, E. H. *Biological Foundations of Language*. Wiley. 1967; ISBN 0-89874-700-7
6. Friederici, A. and S Gierhan. The language network. *Current Opinion in Neurobiology* 2013,

- 23:250–254.
<https://doi.org/10.1016/j.conb.2012.10.002>
7. Friederici, A. Current Opinion in Neurobiology 2013; 23: 250–254.
 8. Blakemore and Choudhury. Development of the adolescent brain: implications for executive function and social cognition. *J Child Psychol Psychiatry*. 2006 Mar-Apr; 47(3-4): 296-312.
 9. Kuniyoshi L. Sakai. *Language Acquisition and Brain Development*. Science: Vol. 310, Issue 5749; 2005 pp. 815-819
 10. Nitin Gogtay, J. N. Giedd, L. Lusk, K. M. Hayashi, D. Greenstein, A. C. Vaituzis, T. F. Nugent III, D. H. Herman, L. S. Clasen, A. W. Toga, J. L. Rapoport, and P. M. Thompson. Dynamic mapping of human cortical development during childhood through early adulthood *PNAS* May 25, 2004. 101 (21) 8174-8179; <https://doi.org/10.1073/pnas.0402680101>
 11. Hyltenstam K. and N. Abrahamson. Maturation Constraints in SLA, in *The Handbook of Second Language Acquisition* (eds CJ Doughty and MH Long), 2003; Blackwell.
 12. Singleton D. and Pfenninger S. L2 acquisition in childhood, adulthood and old age: Misreported and under-researched dimensions of the age factor *Journal of Second Language Studies* 1:2 (2018), pp. 254–275.
 13. Singleton, D. 2005. The Critical Period Hypothesis: A coat of many colours. *International Review of Applied Linguistics (IRAL)*, 43(4), 269–285. <https://doi.org/10.1515/iral.2005.43.4.269>
 14. Singleton, D., & Pfenninger, S. E. (2016). Reporting on politically sensitive issues: The case of telling the truth about early L2 instruction. In H. Rose & J. McKinley (Eds.), *Doing real research in applied linguistics* (pp. 214–224). London: Routledge.
 15. Singleton, D., & Muñoz, C. 2011. Around and beyond the Critical Period Hypothesis. In E. Hinkel (Ed.), *Handbook of research in second language teaching and learning* (Vol. 2, pp. 407–425). London: Routledge.
 16. Pfenninger, S. E., & Singleton, D. 2017. Beyond age effects in instructional L2 learning: Revisiting the age factor. *Bristol: Multilingual Matters*.
 17. Marinova-Todd, S. H., Marshall, B., & Snow, C. E. (2000). Three misconceptions about age and L2 learning. *TESOL Quarterly*, 34(1), 9–34. <https://doi.org/10.2307/3588095>
 18. Litteral, R. Language development in Papua New Guinea. *SIL Electronic Working Papers* 1999-002. S.I.: s.n. 13 pages. www.sil.org/resources/publications/entry/7832
 19. Litteral, R. Language and education in Papua New Guinea. *Workpapers in Papua New Guinea Languages* 24. Ukarumpa: Summer Institute of Linguistics. 1978; Pp. 15-23.
 20. Litteral, R. Vernacular education in Papua New Guinea. Background paper prepared for the Education for All Global Monitoring Report 2005. *The Quality Imperative*.
 21. Devete-Chee, K. and Magury P. M. The Current State of Education in Papua New Guinea. 2017 NRI Blog: <https://pngnri.org/the-current-state-of-education-in-papua-new-guinea-some-facts-and-figures-on-access-and-quality-of-education/>
 22. UNESCO. The use of the vernacular languages in education. *Monographs on Foundations of Education*, No.8. Paris: UNESCO 1953. <http://unesdoc.unesco.org/images/0000/000028/002897EB.d>
 23. UNESCO. *Mother Tongue Matters: Local Language as a Key to Effective Learning*. Paris: UNESCO. 2008c. <http://unesdoc.unesco.org/images/0016/001611/161121e.pdf>
 24. Muñoz, C., & Singleton, D. (2011). A critical review of age-related research on L2 ultimate attainment. *Language Teaching*, 44(1), 1–3. <https://doi.org/10.1017/S0261444810000327>
 25. Walton G., Swan A. and Howes S. 2014. Papua New Guinea's Tuition Fee-Free policy: Is it working?
 26. Walton G., Davda T., and Kanaparo, D. 2017. The challenges of free education in Papua New Guinea. Paper presented at the 2017 PNG Update held at UPNG, Port Moresby, 10-11 August 2017.
 27. Carmen Muñoz and David Singleton (2011). A critical review of age-related research on L2 ultimate attainment. *Language Teaching*, 44, pp 1-35 doi:10.1017/S0261444810000327
 28. Vanhove J (2013) The Critical Period Hypothesis in Second Language Acquisition: A Statistical Critique and a Reanalysis. *PLoS ONE* 8(7): e69172. <https://doi.org/10.1371/journal.pone.0069172>
 29. Elementary English Syllabus 2015 <http://www.education.gov.pg/quicklinks/elementary-syllabus/English.pdf>
 30. Platten G.J. The Use of Vernacular Languages as Vehicles of Instruction Both in School and Out of School and the Related Problems of Teaching in Languages Other Than the Vernacular in the South Pacific. UNESCO, 1951.

LETTER TO THE EDITOR:

DIABETIC FOOT: AN OVERVIEW

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INTRODUCTION:

Diabetes mellitus (type 2) is spreading like epidemic in both developed and developing countries. More than 6% of the global population is affected with Diabetes mellitus. It is highly prevalent in India and China. These two countries are at the top of the list of 10 countries where diabetes is very common [1].

Diabetes mellitus (DM) if not managed properly can lead to retinopathy, neuropathy, nephropathy, cardiac-dysfunction, dyslipidemia, dental involvement, skin involvement and sexual dysfunction; it makes patients prone to different types of infections. Likewise diabetic foot is of the well-known complications of uncontrolled DM.

Diabetic foot is a condition that can occur in diabetic patients who develop wound or an ulcer on the foot. In this modern era the diabetic foot is an important but preventable cause of below knee amputation in some diabetic patients. Diabetic foot is common in those patients who are known diabetics for years having micro vascular complications or triopathy of uncontrolled hyperglycemia, peripheral neuropathy and high

Low Density Lipoprotein (LDL) cholesterol. Patients having high concentration of Glycated hemoglobin (HbA1C), peripheral neuropathy sensory impairment with impaired dorsal column sensation (position and vibration) and lateral sensation (like pain, touch and temperature) are at high risk [1]. When such high risk patients have minor trauma due to ill-fitting footwear, walking barefooted or minor hot water bottle burns during cold season, they can develop diabetic foot. An important issue that should not be ignored is the role of peripheral vascular compromise. Atherosclerosis may be augmented in adults and in patients having dyslipidemia leading to decreased blood flow to the limbs and feet. ABI (Ankle Brachial Index) by Doppler study of the legs to evaluate the blood flow of such patients can be used for diagnosis. If a foot ulcer develops in such a patient it may fail to heal on its own. Several conditions can lead to progression of diabetic wound on the foot; these include impaired neutrophil, monocyte and macrophage functions, small blood vessel disease leading to ischaemia, atherosclerosis

and leading to microthrombi together may lead to compromise of oxygen supply. This hypoxia along with the background of high sugars favours delayed wound healing. In addition, various infections can further complicate the problem.

There can be varied presentations of Diabetic foot: diabetic ulcer/wound limited to skin only; skin and underlying subcutaneous involvement; involvement of Muscle: wound extends to underlying muscle from skin and subcutaneous tissue; bone involvement but only superficial or periosteum; bone deeper areas of bone are affected. The deeper the wound has extended from the skin, the more difficult and complicated is the management. This may lead to a limb threatening situation. All this makes Diabetic foot wound a challenge for a physician to treat. Thus, when diabetic foot is encountered in a Clinical setting joint multidisciplinary management strategy should commence as soon as possible. Besides the physician, orthopaedician and physiotherapist should be part of the team for managing the Diabetic foot.

Management:

Control of Diabetes: This is the most important thing in the management of diabetic foot. The wound can heal only if the underlying diabetes is tightly controlled. Intensive insulin therapy with basal and bolus doses should be started besides oral hypoglycemic drugs. Daily dressing of the wound: The wound may need daily debridement of dead tissue and washing of wound. Different types of dressing material applications can be

used like povidine iodine, silver sulphadiazine, placentarex and hydrogen peroxide can be used either alternatively or sequentially as this provides good results.

Antibacterial cover: As mentioned earlier due to defective leukocyte function abraded skin can be infected by different microbes like staph aureus, streptococci, pseudomonas and others, besides anaerobic organisms. Antibiotics like Cloxacillin, Vancomycin, Cephalosporins, Linzolid (intravenous or orally) can be used along with Clindamycin. Initially we can start parenteral antibiotics and later shift to oral antibiotics. The antibiotics can be given initially for two weeks then alternately for a week, then once weekly owing to dyspepsia and disturbance in gut bacterial flora (dysbiosis). To prevent the gut side effects it is better to give concomitant Proton pump inhibitor (PPI) and lactobacilli.

Off-loading the weight on the limb and foot is important for wound healing to progress. It is important both for a wound on the sole or on dorsum of foot. This prevents the direct pressure on these sites while walking. For offloading many devices are available in the form of sandals or shoes. However, it is better for a patient to seek the opinion of an orthopaedician for suitable and effective offloading device to use [1, 2].

Exercise of the affected limb and foot is very important. This helps in increasing blood flow and vascularity of the foot and also helps in healing of wound. Patient should be kept seated with limbs dangling. The feet should not touch the ground

while doing frequent movements of limbs and feet especially the affected foot and limb.

The newer modalities for management include use of growth factors, topical oxygen therapy, hyperbaric oxygen, platelet rich plasma and bone marrow stem cells. When the foot wound is not responding to treatment and progresses despite optimum treatment, then revascularization may be considered to save the foot and limb [2].

Provision of Education: awareness and education of the patient and family members are very important. This forms the backbone of management and should not be underestimated. Patient and family members are to be educated about the problem. They should be educated thoroughly and be taught about the importance of domiciliary care

Prevention: It is important to prevent the progression of Pre-diabetes to Frank diabetes with the help of changes in life style and modification in diet. The known diabetic patients are to be meticulously managed. Their Glycemic status, blood pressure and dyslipidemia should tightly be controlled. Amongst them patients who have micro or macro vascular complications are prone to diabetic foot, thus they should be identified. The patients having sensory neuropathy and peripheral vessel compromise are the highest risk for developing diabetic foot. Patients should be asked to do self-examinations of foot daily and wipe moisture after washing feet or sweat. In addition, cracks on the sole and heel

of the foot should be taken care of promptly. These patients should wear soft footwear; any abrasion or infective focus on the foot should be treated immediately. Toe nails should be cut with utmost care. Aspirin a non-steroidal anti-inflammatory and anti-platelet drug has been used along with other drugs in different interventional studies to halt the progression of micro and macrovascular involvement in diabetic patients [3]. The dose of Aspirin 75-300 mgs daily has been administered to diabetics with cardiovascular morbidity safely. In many studies aspirin has been used in diabetic retinopathy prevention [4]. Aspirin has been used for prevention of vascular damage and diabetic foot but the benefits of which seem to be better when used much early but for primary intervention [5,6].

REFERENCES:

1. Samar Banerjee, S. V. Madhau, Rajeev Chawla. RSSDI Handbook of Diabetes 2016
2. International Diabetes Federation Atlas; 5th edition 2011.3,
3. Sunil V. Kari. The economical way to off load diabetic foot ulcers. Indian J Surg. Ap 2010, 72(2); 133-134; published online July 1, 2010.
4. Syed Arshad Hussain, Shamila Hamid. Aspirin in the prevention of Diabetic retinopathy. Journal of Medical Sciences Vol. 11. No 2, May, 2008, 92-95
5. Peter Goede, Pernille vedel, Nicolai Larsen. Multifactorial intervention and CVS disease in pts with type 2 DM; The NEJM Jan 30, 2003 Vol 348: no 5, 383-393.
6. Ferederick L, Ferris Mathew D, Davis. Treatment of diabetic retinopathy. NEJM.UG 26, 1999 Vol 341; 667-678.

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Text of an original manuscript should be separated into the standard IMRAD format as follows: Introduction, Materials and Methods, Results, Discussion. Sections on Acknowledgements and References should be included.

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Acknowledgements:

The following should be acknowledged: Research or other financial grants; Material support, Contributions of Institutions, Colleagues, and other relevant participants.

References:

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Book:

Gillett JE. The health of women in Papua New Guinea. PNGIMR: Kristen Press, 2010

Chapter in a Book:

Chaney SG. Principles of nutrition II: Micronutrients. In: Delvin TM, editor. *Textbook of Biochemistry with Clinical Correlations*, 4th ed. Brisbane: Wiley-Less, 2010: 1107– 36.

Published proceedings paper:

Kruse-Jarres JD. Basic principles of zinc metabolism. In: Kruse-Jarres JD, Scholmerich J, editors. *Zinc and diseases of the digestive tract. Proceedings of the International Falk workshop, Germany, 2010: 3 – 15.*

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