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A multidisciplinary journal for publication of medical and biomedical research findings on issues pertinent to improving family health and related issues of public health

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A multidisciplinary journal for publication of medical and biomedical research findings on issues pertinent to improving family health and related issues of public health

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# COMPARATIVE STUDY OF HEPATITIS B INFECTION AND RELATED CO-INFECTIONS IN VOLUNTARY AND FAMILY REPLACEMENT BLOOD DONORS AT PORT MORESBY GENERAL HOSPITAL BLOOD TRANSFUSION SERVICE: A RETROSPECTIVE STUDY

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# ABSTRACT:

This retrospective study was carried out at the Blood Transfusion Service in Port Moresby General Hospital, which is a teaching and specialist Hospital in the National Capital District Papua New Guinea. The aim of this study was to statistically assess if family replacement blood donors pose a higher risk of transmission of infection than voluntary donors. For every 10 voluntary donors who donated blood each month from 2010-2014, 10 family replacement donors were randomly selected and analysed retrospectively using data from archived record books. The Chi-square test was used to compare the infection difference in the two populations and odds ratio was also calculated. No statistically significant differences in HIV and syphilis infections were obtained between the two blood donor groups, though the risk of voluntary donors being infected with the HIV was high (OR 1.1579, 95%CI 0.8125-1.6502). However, statistically significant difference existed in HBV infection, with all donors positive for HBV were found among Family replacement donors. Our data indicated that family replacement donation should not be completely discouraged especially in settings where there are acute shortages of blood supply.

**Keywords**: Voluntary Donors, Family Replacement Donors, Hepatitis B Virus, Human Immunodeficiency Virus, Syphilis.

#### INTRODUCTION:

Hepatitis B is the most common liver infection in the world and is caused by the hepatitis B virus (HBV) [1]. It affects approximately 2 billion people worldwide, three quarters of which are chronic carriers and are found in Asia and the Western Pacific region [1]. Countries like Africa, Asia and the Western Pacific region have high HBV prevalence (> 8%), Southern and Eastern Europe have prevalence of 2-7% (intermediate), while Western Europe, North America and Australia have low prevalence [1]. In areas of high prevalence, the mode of transmission is mainly vertical; from mother to child during child birth. A study on women of child-bearing-age in Papua New Guinea (PNG) revealed that 85% of them had markers to the HBV, 37% tested positive for the HBsAg, while 6.6% tested positive for the e- antigen (HBsAg) [2]. About 90% of the cases were acquired perinatally as compared to areas with low prevalence where acquisition was mainly through unprotected sex and drug abuse [3]. In countries with intermediate prevalence rate, the virus may be acquired mainly through horizontal means [4]. During childhood, children are very active and therefore the virus can be spread through cuts or open sores on the skin, sharing of chewing gum, tooth brush and towels especially in developing countries [4]. Several studies have reported that the virus can also be transmitted through contaminated human blood and blood products during transfusion [5-8].

Other pathogens that can be detected in blood and its products and also transmitted mostly through sexual contacts are Trepanoma *pallidum* (TP), the bacteria that causes syphilis, and also the Human immunodeficiency virus (HIV). In PNG, there has been no documented case of blood transfusion transmission of the HIV; although an average of 15% blood donors have been demonstrated to be positive for HBV [9]. Since then, there has not been any published article on the HBV prevalence in blood donors nationwide. However, according to a poster abstract published by the Official Journal of the Australasian College of Tropical Medicine (ACTM) in July 2011, an overall HBV prevalence of 25.4% (95%CI 24.49-26.26%) was demonstrated in blood donors from East New Britain Province, Papua New Guinea [10]. Blood and its products are not manufactured, but donated by people who either voluntarily (voluntary donors) donate it to someone in need or are paid to give their blood to someone in need. Family members or relatives (family replacement donors) also give their blood to help a relative or family member, or even a close friend. Blood and its products have many clinical applications. In PNG, the need for blood for patient care is very high but the availability is very limited [11]. The country has also been reported to be facing acute shortages of blood in all the major provincial and district hospitals in 2015 [12].

Provision of safe blood to those in need is therefore the norm of every blood bank transfusion services in PNG and elsewhere. It is now well documented by the World Health Organization (WHO) that voluntary donation is safer than family replacement in most parts of the world [13]. In the United States of America (USA), transmission of the hepatitis B virus through blood transfusion has decreased owing to adequate blood screening and exclusion of paid blood donors [1]. The same scenario is also seen in many other European countries [14]. These countries have taken initiatives to promote voluntary and unpaid donations through information campaigns, students' awareness and setting aside or making use of special days to promote voluntary blood donation [14]. In PNG, the Manager for PNG

Blood Transfusion Services have used social media such as FaceBook and "Radio Talk Back" show on 100FM to help save a life by donating blood and also to thank those voluntary donors who have been faithfully donating regularly [12].

In PNG, it is possible that some sections of the population are unaware of blood borne diseases, due to lack of awareness. Blood bank centres throughout the country continue to face acute shortages of blood supply [12] and therefore quite often family members are asked to donate. Based on the findings reported by the WHO [13], if family members continue to be the major blood donors for their relatives it is more likely that the risk of transmission of infection to recipients may remain high. In PNG there are no published data comparing the prevalence of infection among voluntary and family replacement blood donors. Therefore, this study was carried out to statistically assess if family replacement blood donors in this setting pose a higher risk of transmission of infection than that of voluntary donors.

#### METHODS:

A retrospective study was done using archived blood transfusion data records at Port Moresby General Hospital Blood transfusion service (PMGHBTS) from 2010 to 2014. Blood donors from all walks of life donate blood in the PMGHBTS because it is situated in the National Capital District (NCD) which is the capital city of PNG. Data collection from the archived records was carried out systematically. For every first 10 voluntary donors (VD) for every month of each year in the period studied, 10 family replacement donors (FRD) were also recorded. Other parameters collected were date of donation, age, gender, employment status, donor status (old or new donors), infection status (HBV, HIV & Syphilis) and donation type (voluntary or family replacement). All data were recorded onto Microsoft Excel Spreadsheet (version 2010).

Chi-square test was used to compare the data; Fishers Exact test was used where sample populations were small. Level of significance was set at 0.05. Qualitative data were described in numbers and percentages. The odds of each group of donor type being infected by any of the three pathogens were calculated using Odds ratio (OR) statistics. Confidence interval (CI) was also calculated to ensure the CI will contain the true OR. Ethical clearance and permission for this study was obtained from the University of Papua New Guinea, School of Medicine and Health Sciences (UPNG SMHS) research and ethics committee and the appropriate authority in the PMGHBTS.

#### RESULTS:

A total of 120 voluntary donors (VD) and 120 family replacement donors (FRD) were randomly selected each year from record books at the PMGHBTS. Thus a total of 240 donors were selected each year. Table 1 shows the gender distribution of the donors selected. Over the five years (2010 to 2014) duration of the study 600 VD and 600 FRD were selected. This gave a total of 1, 200 randomly selected donors. Gender distribution of the 1200 donors showed 79.7% males (956/1200) and 20.3% females (244/1200). Thus the male to female ratio was 4:1.

Table 2 shows the yearly distribution (%) of the VD and FRD infected blood donors out of the 120 selected in each group. The yearly distribution shows similar trends for the VD and FRD, with no statistically significant difference between the two groups of donors. The cumulative data for the five years duration of the study indicates that out of the 1200 donors 22.9% (275/1200) were infected and 77.1% (925/1200) were not. The total number of infected donors over the five years duration of the study was slightly higher among the FRD (23.7%; 142/600) compared to the VD (22.2%; 133/600). The difference was not statistically significant. Thus, no significant difference was obtained between the two groups of donors throughout the 5 years study period.

Distribution of all the blood donors according to age groups is presented in Table 3. The highest number of donors (334/1200, 27.8%) was in the  $\geq 35$  year's age group closely followed by donors (326/1200, 27.2%) in the 20 to 24 years age group. The distribution of VD and FRD according to age groups and the distribution of infections according to age groups is also presented in Table 3. Although HIV was almost 20.0% in the 25-29 years age group, the prevalence of HBV (0.5%) was lower compared to the other age group.

Of the 275 infected donors 84.0% (231/275) were males and 16.0% (44/275) were females. The 231 male infected donors consisted of 51.5% (119/231) VD and 48.5% (112/231) FRD. The 43 female infected donors were made up of 31.8% (14/44) VD and 68.2% (30/44) FRD. Further stratification of the 275 infected donors indicated that 44.7% (123/275) were old blood donors and 55.3% (152/275) were new donors. Among the old donors 54.5% (67/123) were VD and 45.5% (56/123) were FRD. For the new donors, 43.4% (66/152) were VD and 56.6% (86/152) were FRD. Analysis of the social status of the 275 infected donors showed that 71.3% (196/275) were employed, 5.4% (15/275) were unemployed and 23.3% (64/275) were students. Among the employed donors 39.8% (78/196) were VD and 60.2% (118/196) were FRD. All the unemployed donors were FRD. For the students donors 87.5% (56/64) were VD and 12.5% (8/64) were FRD.

#### Single and Co-infections:

Of the 275 infected donors, 20 (7.3%) had dual infection but no triple infection. The majority of those co-infected were FRD (13/20, 65%), while 7/20 (35%) were VD. Of the 20 with dual infection, 14/20 (70%) were co-infected with HIV and syphilis, while a total of 6/20 (30%) donors were infected with HBV-syphilis. There

was a statistically significant difference between the two donor populations in HBV-Syphilis infection, while the difference in HIV-Syphilis dual infection was not (Table 4). A significant (p<0.05) difference in infection by the HBV virus between VD and FRD was demonstrated. Over the five year duration of our study more (17/600; 2.8%) FRD were infected with HBV than VD. While there was higher numbers of infections by HIV and Syphilis in both groups of donors, there was no significant (p>0.05) difference in the frequencies between them (Table 4).

VD were less likely to be infected with HBV than FRD and were also less likely (OR = 0.9) to be infected with syphilis. While the VDs are less likely to be infected with the latter two pathogens, they are more likely to be infected with HIV (Table 5).

Table 1: Gender distribution of the donors selected each year

Year	Total donors	Male donors	Female donors
2010	240	182 (75.8%)	58 (24.2%)
2011	240	181 (75.4%)	59 (24.6%)
2012	240	180 (75.0%)	60 (25.0%)
2013	240	202 (84.2%)	30 (15.8%)
2014	240	211 (87.9%)	29 (12.1%)
Total	1200	956 (79.7%)	244 (20.3%)

Table 2: Yearly distribution (%) of Voluntary and Family Replacement infected blood donors

Year	Voluntary donors (VD)	Family replacement donors (FRD)
2010	30/120 (25.0%)	30/120 (25.0%)
2011	21/120 (17.5%)	25/120 (20.8%)
2012	24/120 (20.0%)	29/120 (24.2%)
2013	26/120 (21.7%)	25/120 (20.8%)
2014	32/120 (26.7%)	33/120 (27.5%)
2010-2014	133/600 (22.2%)	142/600 (23.7%)

Age groups	≤19 yrs	20 – 24yrs	25 - 29yrs	30-34 yrs	≥35yrs
Voluntary Donors (n = 600)	114 (19%)	134 (22.3%)	75 (12.5%)	46 (7.7%)	98 (16.3%)
Family Replacement donors (n = 600)	33 (5.5%)	115 (19.2%)	70 (11.7%)	82 (13.7%)	158 (26.3%)
Total (n = 1200)	184 (15.3%)	326 (27.2%)	202 (16.8%)	154 (12.8%)	334 (27.8%)
HBV positive	0 (0%)	6 (1.8%)	1 (0.5%)	3 (2.0%)	7 (2.1%)
HIV positive	18 (9.8%)	36 (11%)	36 (17.8%)	14 (9.10%)	36 (10.8%)
Syphilis positive	19 (10.3%)	35 (10.7%)	20 (9.9%)	9 (5.8%)	35 (10.5%)
Total positive	37 (20.1%)	77 (23.6%)	57 (28.2%)	26 (16.9%)	78 (23.4%)

Table 3: Distribution of blood donors according to age groups

Table 4: The prevalence of infection between Voluntary and Family replacement donors over the five years duration of the study

	Voluntary Donors (n = 600)	Family Replacement (n = 600)	Chi square	P-value
Infection				
Infected	133 (22.2%)	142 (23.7%)	0.382	0.537
Not Infected	467 (77.2%)	458 (77.0%)		
HBV				
Positive	0 (0%)	17 (2.8%)	17.244	0.00
Negative	600 (100%)	583 (97.2%)		
HIV				
Positive	78 (13%)	62 (10.3%)	2.07	0.15
Negative	522 (87%)	538 (89.7%)		
Syphilis				
Positive	55 (10.8%)	63 (12.2%)	0.602	0.438
Negative	545 (89.2%)	537 (87.8%)		
Co-infection				
Positive	10 (1.7%)	10 (1.7%)	0.000	1.000
Negative	590 (98.3%)	590 (98.3%)		
HBV / Syphilis				
Positive	0 (0%)	6 (1%)	6.03	0.014
Negative	600 (100%)	594 (99%)		
HIV / Syphilis				
Positive	10 (1.7%)	4 (0.7%)	2.602	0.107
Negative	590 (99%)	596 (99.3%)		

	OR	95% CI
HBV	0	0
HIV	1.1579	0.8125 - 1.6502
SYPHILIS	0.8636	0.606 - 1.2307

Table 5: The association of infection between each donor population

#### DISCUSSION:

The result indicated that there was no statistically significant difference (p = 0.537) between the infected family replacement blood donors (FRD) and the infected voluntary blood donors (VD), 23.7% and 22.2% respectively, that participated in the present study. This finding is different from the results obtained in a study done in Laguintinie hospital in Doula, Cameron in 2014 [8] that revealed 14.3% of those infected were FRDs and 8.3% were VDs, which was similar to the results obtained in Pakistan in 2006 [15]. Two studies in Egypt also revealed higher infection among the FRD compared to the VD, which was 8.0% compared to 4.5% respectively in 2013 [16], and also 6.8% compared to 4.2% respectively in 2014 [17]. The differences in the prevalence of infections between the two groups in these studies were significant different. These results could be explained by the fact that there were more FRD than VD in the two studies. In addition, a different method of selection of donation types may have been used compared to the method used in the setting of our present study.

In developing countries like PNG, family members are more likely to willingly come forward to donate blood, especially when a family member or relative is in dire need of blood for fear of the relative dying, and also because of strong family ties. Since our study was retrospective, it is possible that some of the FRD could be friends that are not genetically related to the recipients but felt obliged to give blood out of generosity to the friend.

Our findings also indicated that VD was more frequently infected with HIV than FRD while FRD were frequently infected with syphilis and HBV (Fig 4). Differences in infection between the two donor populations were not statistically significant. There was however, a significant difference in infection with the Hepatitis B virus existed between the two donor groups (p=0.000) with FRD being the only donor population showing HBV infection than VD (2.8% and 0% respectively).

When stratified by age, a significant (p= <0.000) difference was demonstrated among the different age groups with those in the age 35 years and above were mostly infected than

the younger donors (Table 3). In contrast to our present study, a study in Nigeria in 2015 revealed no significant difference in HBV infection among the donor populations when stratified by age [18]. Our finding was however similar to other studies [16-21] that revealed significantly higher prevalence of HBV infection in FRD; although according to the authors downward trending in infection rate was observed over the years [15,17-19]. The authors also reported that despite the decreasing trend, one of the major reasons for discarding of donated blood was still due to HBV infections [25].

In a study done in Brazil in 2005 [26], the prevalence of HIV in VD was higher than FRD (19.6% and 16.1% respectively) though the difference was not statistically significant. This finding was closely related to our present study, although in Tamil Nadu the number of HIV infected donors was significantly high among the FRD [19]. High sexual activity amongst the young in Brazil was the main attribution to demonstration of significant difference between the two donor populations [26]. It is possible that the same attribute can also be a reason for the high number of HIV infection among the VD compared to the FRD in our setting. However, further studies are needed to substantiate this presumption. When stratified by age, however, a significant difference (p = < 0.000) in HIV infection existed among the different age groups with those aged between 25-29 years having the highest prevalence (Table 3). In the

Egyptian study in 2013 [16], HIV infection among the VD and FRD were demonstrated to be equal (0.7% and 0.7% respectively) with increasing trend observed in both, in contrast to a decreasing pattern of HIV seropositive donors in India [17, 27]. This has been partly attributed to both religious and cultural behaviour in these parts of the world where premarital sexuality is discouraged and circumcision is a common practice [16, 27]. Voluntary non-remunerated blood donation (VNRBD) has also been assumed to be one of the major reasons for such decreases [22].

In contrast to yet another Egyptian study [17], syphilis infection among the two donor populations in our present study was not statistically significant; Egyptian study: 0.3% FRD and 0% VD, p=0.024 and in our present study: 12.2% FRD and 10.8% VD, p=0.438.

This may be explained by the low number of donors (1200) used in our present study compared to the Egyptian study (17118).

In our present study no statistically significant differences were observed when the prevalence of co-infections among the donor groups was compared.

However, when stratified according to type of infections, a significant difference existed between HBV/Syphilis co-infected donors.

HBV/Syphilis co-infection was prevalent (1.0%) among the FRD. This is similar to Kumar *et al.* [28] whose study revealed HBV/Syphilis coinfections (3.7%) as more common and prevalent among FRD. HIV/Syphilis co-infection was also prevalent in this same study at 2.9% [28], though in our study, HIV/syphilis coinfection was not found to be significant (Table 4). Furthermore, in our study, syphilis infection was mostly found among 20-24 years age group and also among those in 30 years and above age groups; while HIV infection was mostly found among the younger population 19-34 years. HBV infection was more prevalent among the older population age group above 35 years. This may indicate that sexual transmission is one of the main modes of transmission. Because of common modes of transmission, prevalence of co-infections can be detected simultaneously in the same donor group [29].

In syphilitic infections, ulceration of the genital increases the risk of transmission of HBV and also other viral pathogens such as HIV and HCV. According to Kumar et al. [28], in the presence of syphilis, HIV viral load increases, while CD4 T-cells declines. This resolves, however, when the syphilitic infection is treated. Co-infections may affect several factors during the course of treatment of one of the infections. Such factors include; clinical presentation, response to treatment and additional infection [30]. This calls for introduction of thorough donor screening methods to increase blood safety to recipients in the setting of our present study. Our results show that among the male donors infection was more prevalent among the VD (51.5%), while among the female infection was more prevalent among the FRD (68.2%).

This is in contrast to Shoba & Babu [25], whose study demonstrated the male VD population having lower rates of infections (n=4538, 97.3%) than FRD (n=1426, 99.6%). On the other hand, in this same study, the female VD population had higher rates of infection (n=124, 2.7%) than FRD (n=6, 0.4%) [25]. This is in contrast to the current study where the number of infected female FRD was two times higher than the female VD (n=30, 68.2% vs n=14, 31.8%) respectively.

The differences in the data presented may be due to several reasons. More male VD coming forward to voluntarily donate than females who would rather give to family and friends than to someone else they do not know. Apart from this, females are more likely to be the ones visiting sick relatives quite often in hospitals than males, and therefore, are on hand for when there is urgent need for replacement donations. These females quite often do not consider their social status before donating. These assumptions however need to be substantiated through large prospective studies in our setting.

Among the donors that have been donating or have donated once or more in the past (old donors), infection was more prevalent among the VD (54.5%) compared to the FRD (45.5%), while among the donor population that donated for the first time (new donors), infection was more prevalent among the FRD (56.6%) compared to the VD (43.4%). Difference among the two groups of donors was not statistically significant (p=0.076). According to Jemia & Gouider [21], infections were significantly higher for HBV and syphilis in older (30-39 years old) first time replacement donors than first time voluntary, while HIV infection rates were insignificant. This is in concordance with this study except that, in this study, there was no significant difference in infection rates between the two groups. The risk of infection is usually higher in new FRD because they may have been pressured or may have been paid [15] to donate and therefore may have concealed their risky behaviour, escaping being excluded during the pre-donation screening process. In the case of new VD, they may simply be donating for the sole purpose of knowing their serological status and therefore feel safe to donate.

In this study, more old VD were infected than FRD. This is in contrast to other studies [31-32], where the prevalence rates of infection was low among the old VD. Further studies are suggested to determine the reasons for such a scenario in our setting. It is possible that the screening process is not very effective. According to Jemia & Gouider [21] and Marantidou et al. [33], FRD increases the risk of HBV infection transmission. In a review on VNRBD, sound evidence have supported the notion that new VD may not be safer in donating blood than FRD and that only old VD increases blood safety [34]. The findings of this article implied that if VNRBD is the only source of blood to improve safety, then there will be a

lot of deferrals that will lead to chronic shortage of blood supply, also taking into consideration the cost in keeping patients in hospitals, while waiting for VD to donate. In PNG, where blood banks continue to face blood shortages [12], we cannot afford to completely do away with FDR. In fact, both types of donations should be encouraged.

Infections among employed FRD was significantly higher than among students and unemployed donors (p<0.000). According to some authors [22, 25] professional donations should be discouraged; individuals should be encouraged to become voluntary blood donors, though such professional donors can still continue to donate in the guise of friends or relatives. According to the authors, the banning of professional donors resulted in reduction in discards of infected donors' blood [22]. Despite this reduction, donated blood may still be discarded due to other reasons such as contamination by bacteria through culture, clotting, haemolysis or expire blood [25].

Targeting students for voluntary blood donation could be a better way to reduce transmission of pathogens through transfusion. However, knowledge and attitudes on blood donation is of paramount importance. A study among Health Science Students in an Indian university reported that the majority of the students indicated that if only they are more knowledgeable about the importance of donating blood, they will be willing to donate [35]. Among Health care support staff in an Indian Tertiary Care Hospital, knowledge about blood donation regarding safety and eligibility was lacking. Furthermore, ways in which they can be motivated to donate blood was also low [36]. These are indications that awareness & motivational campaigns should be promoted to bring about positive attitudes towards blood donation and hence increase blood safety. Students are young, healthy and vibrant. In fact, the WHO is promoting a younger generation of voluntary donors, in collaboration with other stakeholders to live healthy life style that would contribute to safe blood donation [37]. In the present study, the likelihood of voluntary donors being infected with HBV is very low, unlike with syphilis and HIV. Infact, the likelihood of a VD being infected with HIV is high. This finding supports the findings of Jemia & Gouider [21] whose study demonstrated that replacement type of donation apart from the male gender and age are independent risk factors for HBsAg carriage. However, in his review on evidence on the pros and cons of VNRD-only strategy, Allain, [34] observed that in two African countries, significantly high HBsAg prevalence existed in first time VNRD than replacement donors. This indicated the need to carefully categorize the donor populations into clearly defined and distinct groups other than generalizing. The high probability of VD being infected with HIV in this study may mean that many of these donors may have been first time VD and not necessarily repeat donors (old donors), who

donate regularly and know their serological status. This hypothesis needs proving through prospective studies in this setting.

# CONCLUSION:

This study revealed statistically insignificant differences between VD and FRD except HBV infection. However, the likely hood of VD being infected with HIV is high; therefore FRD should not be discouraged from donating blood, especially in settings that face acute shortages of blood supply.

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# EFFECTIVENESS OF THE UPTAKE AND IMPLEMENTATION OF AN ABORIGINAL AUSTRALIAN EMPOWERMENT PROGRAM IN THE CONTEXT OF PUBLIC HEALTH TRAINING IN PAPUA NEW GUINEA

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# ABSTRACT:

An initial collaboration between Australian and Papua New Guinea (PNG) researchers established the suitability of the Aboriginal Australian Family Wellbeing empowerment program (FWB) in University of Papua New Guinea (UPNG) public health training. This study seeks to determine the effectiveness of program uptake and implementation by the PNG partners. A total of 30 students in the UPNG participated in 40 hours of FWB. Qualitative workshop evaluations were compared with those of the initial study. Quantitative pre and post surveys measured students' initial and subsequent sense of wellbeing in three areas. Local uptake and implementation were effective: UPNG partners from the initial pilot facilitated the FWB program in their own right and achieved similar results. Students found the FWB content and delivery highly relevant and empowering. They reported enhanced capacity to improve their own wellbeing and help others to do the same. Quantitative results showed minor improvements, or deterioration, in reported wellbeing, arguably because post-intervention data were not collected immediately after training but rather at different times. Despite this, the study highlights the need for appropriate and well-tested quantitative measures and dedicated research funding to improve the evidence-base for social health interventions such as FWB in the PNG context.

**Keywords**: Empowerment, Family Wellbeing program, interpersonal violence; program transfer; self-reported wellbeing measures; student/military confrontations

#### INTRODUCTION:

The transfer and implementation of acceptable and effective health services and programs across settings provides an important and potentially cost-effective strategy for promoting health and wellbeing, especially in resourcepoor countries [1]. It is important when transferring programs and services from one context to another to monitor and evaluate their acceptability, effectiveness and sustainability over time. This paper builds on a partnership between Australian and Papua New Guinea researchers designed to explore the transfer and implementation of an Aboriginal Australian Family Wellbeing empowerment program to Papua New Guinea (PNG) settings [2,3].

The Family Wellbeing (FWB) program is an evidence-informed group intervention developed by Aboriginal Australians to enhance their collective capacity to negotiate a constantly-changing and uncertain world and the problems associated with being a minority population in their own country [4, 5]. The premise of the program is that there are no easy answers or readymade templates for dealing with complex, so-called 'wicked', problems such as the legacy of colonial dispossession, racism, discrimination, poverty, intergenerational trauma. interpersonal violence and substance abuse. The creators of FWB sought to give people skills that would empower them to build support networks, to self-reflect, to learn to heal from emotional pain

and to solve problems using creativity and innovation no matter how difficult or challenging the situation [4,5].

The FWB approach to empowerment has four main components which often occur in parallel rather than sequentially. The first step is to establish the setting. People are brought together in small interactive participant groups and introduced to the premise that as individuals they are responsible for their own wellbeing; that they have the capacity to take control of their lives and make positive changes to improve their day-to-day situation, no matter how dire that may be. The second element involves the creation of a safe space where these ideas can be discussed and developed. This safe space is established through the development of negotiated group agreements and peer-support relationships based on confidentiality, respect, authenticity, empathy, sharing and trust. The third component shows participants, through experiential exercises, how to think and communicate effectively using human qualities such as creativity, innovation, forgiveness, perseverance, empathy, commitment and generosity. The fourth component aims to help participants recognize their own experience and knowledge, their strengths and basic human needs. Change is facilitated through exploring alternative ways of dealing with problems, difficult relationship patterns, violence and abuse, emotion, loss and grief, conflict and crisis. Participants are also encouraged at this stage to open up and share their fears and their insights with others, to build support networks, practise problem and conflict resolution, identify change objectives and implement and monitor changes. The result of the process is that participants are not only able to exert greater influence and responsibility over their own situations, but they become agents for change in their family, workplace and community [4,5,6, 7].

On becoming aware of the Australian FWB research, researchers from the University of Papua New Guinea (UPNG) invited Australian researchers to participate in a collaborative project to explore the relevance and adaptability of the FWB program to the social, health and political challenges currently facing PNG. UPNG is the premier university for PNG and the Pacific, located in Port Moresby in the National Capital District (NCD). Its mission is to provide quality education, research, and service for nation-building and global advancement towards an innovative and empowered society [8]. Although PNG culture and society differs in many respects from the situation of Aboriginal Australians, the FWB's basic human needs approach to empowerment was considered to be universal and hence potentially applicable to the "empowered society" vision of the UPNG.

It is believed that skills relating to core public health business such as disease surveillance, management and control tend to be adequately covered. However, public health students in the School of Medicine and Health Sciences (SMHS) UPNG had no access to practical social health tools to enable and empower communities to take greater control and responsibility for building safer and healthier social environments so that individuals can achieve better health and wellbeing. This situation led to interest in the potential of the Australian program to fill the social health gap within the UPNG public health teaching program.

Based on train-the-trainer principles, the Australian team facilitated the introduction of the FWB program to staff and students in postgraduate public health courses at UPNG. There were three separate deliveries between 2009 and 2011 to over 100 [2,3] students with the goal of preparing the PNG partners to facilitate the program in their own right.

FWB was well received, and qualitative course evaluations demonstrated the relevance of the approach to many of the social and health problems confronting PNG. including interpersonal violence [2, 3]. The findings also indicated that the approach was more likely to be sustained when integrated into existing education courses. UPNG saw the relevance of FWB for equipping health professionals to better enable and support family groups, communities and organisations to improve health and wellbeing at local levels, and officially incorporated the program as a core subject within its public health training [3].

Since 2012, some of those that participated in the FWB program have routinely facilitated FWB empowerment training with other public health students in their own right. This paper follows on from the previous research to examine the effectiveness with which the UPNG partners have adapted and facilitated the FWB course.

#### METHODS:

Study Design: Based on previous FWB empowerment evaluation in tertiary settings, a sequential exploratory mixed-methods design was adopted in which quantitative measures were piloted to test their sensitivity and complement qualitative workshop evaluation data [9]. The main question guiding the study was: how effective is the uptake and of the implementation Aboriginal FWB empowerment program in the context of UPNG public health training? Program uptake and implementation was considered effective if the FWB delivery by UPNG research partners achieved comparable results to those of the initial study.

**Participants and Setting**: Two groups of public health students participated in the study as part of their public health training at the Division of Public Health (DPH), SMHS UPNG. One group consisted of 10 part-time distance education students who attended a 1-week intensive FWB workshop during a six-week residential school. The second group consisted of 20 students who studied on campus full time.

Measures: To assess program uptake and implementation effectiveness, qualitative workshop evaluation outcomes were assessed and compared with those of the initial feasibility pilot study [2,3]. The aim was to determine the extent to which local UPNG researchers took up and implemented the program to achieve outcomes similar to the initial Australian study. partner-led feasibility pilot А FWB workshop standardised evaluation questionnaire was administered immediately after the end of the intervention. As well as collecting demographic data (age and gender), Part 1 of the qualitative questionnaire asked participants to provide feedback on what they liked and/or disliked about the program; the extent to which their expectations were met; how they intended to use FWB skills within family, workplace, and broader community settings and to suggest ways to improve the program. Part 2 of the questionnaire used a 10-item Likert scale to gauge the extent to which students perceived FWB as relevant to PNG, and their level of understanding and confidence in using the knowledge in their family and professional roles. Students were asked to what extent they agreed or disagreed with statements such as "family wellbeing is relevant to PNG" and "after doing this course I feel really competent to teach it".

Quantitative pre and post surveys were used to: 1) understand the students' wellbeing prior to the intervention measured by levels of safety and violence in their social environments, psychosocial empowerment and subjective wellbeing; and 2) investigate changes in responses after the intervention measured by the Australian-developed surveys using effect size approach.

The first aspect is addressed using 5 questions taken from the Australian Bureau of Statistics (ABS) Personal Safety Survey (10,11). Three questions use a nominal scale (yes/no answers); two use an ordinal scale ranging from 1 (very unsafe) to 5 (very safe). A key objective of the Personal Safety Survey (PSS) is to measure perceived levels of violence in the participants' social environment. For the purposes of this survey, violence is defined as any incident involving the occurrence, attempt or threat of either physical or sexual assault experienced by a person during the 12 months prior to the survey.

Psychosocial empowerment is measured by the Growth and Empowerment Measure (GEM14) developed specifically to evaluate psychosocial empowerment among FWB participants [12]. This tool consists of 14 items, and has 3 subscales: the "Inner Peace" subscale (items 2, 3, 4, 10, 11, 12, 13, and 14); the "Self-Capacity" subscale (items 5, 6, 7, and 9); and "others" (items 1 and 8) which address strength, happiness, and connectedness. All items on the GEM14 are rated on a 5-point scale between two extremes. For example, for item 1, which asks about knowledge, the lowest point on the scale is "I feel like I don't know anything", while the highest is "I am knowledgeable about things important to me". The measure provided an overall score (maximum score =70), as well as scores for each of the three subscales. The final measure, the Australian Unity Well-Being Index, is a scientific measure of "subjective wellbeing" [13] which asks people to rate their satisfaction from 0 (completely dissatisfied) to 10 (completely satisfied), across eight aspects of their personal life: health, personal relationships, safety, standard of living, achieving in life, community connectedness, spirituality or religion and future security. An overall score was calculated for this index (maximum score = 80). The survey questionnaires are presented in Annex 1.

**Data Collection**: The study was approved by the Human Research Ethics Committee at James Cook University (JCU), Australia and the SMHS UPNG Research and Ethics Committee. The purpose of the questionnaires was explained to the student participants. They were also told that completion of the questionnaire represented their consent to participate in the study, that participation was voluntary and that participants are free to withdraw from the study at any time. Pre and post intervention questionnaires were administered to Diploma of Public Health students before and after the FWB program. The qualitative workshop questionnaire was administered during the final session of the workshops while the quantitative questionnaire was administered at the outset of the FWB training and between two to five months after completion of the FWB training.

The FWB intervention: The two groups of students attended a total of 40 hours of the FWB program as part of their public health training. Key FWB topics covered included group agreement, human qualities, basic human needs, understanding relationships, life journey, conflict resolution, understanding emotions and crisis, loss and grief, beliefs and attitudes and understanding interpersonal violence. Both groups attended the course during the same semester: the 10 distance education students attended a six-week intensive residential block, while the 20 oncampus students attended weekly 3-hour workshops over the 13 week semester.

#### Data analysis:

**Qualitative**: Student responses to the evaluation questions after the final session of the FWB training were combined and thematically analysed. This process was based on the 6 steps recommended by Braun and Clarke [14]: 1) familiarize ourselves with the data; 2) search for codes; 3) create themes; 4) review themes; 5) name and define themes and 6) write the report. To ensure rigor and

trustworthiness, the initial data coding and analysis was work shopped by three careful researchers through reading, independent coding and comparison of codes, and discussion and debate about preliminary themes. This collaborative work shopping also improved the effectiveness of the interpretive process [14]. Differences in interpretation were negotiated until consensus was reached. The data analysis workshop was intended to serve as a capacity-building exercise.

Quantitative: Participants were requested to complete the FWB guestionnaire before and after the intervention. Given the relatively small sample (n=30) and unmatched pre-post surveys the approach to the analysis of survey responses was largely descriptive. A Wilcoxon signed rank test was conducted to assess changes between the average pre-post scores across the GEM survey, the Australian Unity Well-Being Index survey and Part 2 of the PSS. Differences between pre-post yes/no responses from Part 1 of the PSS were examined using Fisher's exact test. P<0.05 was reported for significance of results. Effect sizes were calculated to indicate the sensitivity to change of the GEM Scale, the three subscales and the Australian Unity Well-Being Index (AUWBI). Effect sizes (r) were calculated using the methodology of Berry et al. [15]. Cohen [16] suggests that r values greater than 0.5 may be considered large, greater than

0.3 may be considered medium and greater than 0.1 may be considered small.

#### RESULTS:

Study population demographics: Gender distribution of the 30 students that participated indicated that 56.7% (17/30) were male and 43.3% (13/30) were female. Distribution of the students according to age-groups showed that 6.7% (2/30) were in the  $\leq$ 34 years age-group, 83.3% (25/30) were in the 35 to 54 years and 10.0% (3/30) in the  $\geq$ 55 years age group. Overall, 30 students completed the surveys, with all completing the pre, and 28 completing both pre and post surveys.

Qualitative: The participants were mostly very positive about both the content and process of the FWB program. They saw it as highly relevant to personal, family and community its potential to needs given enable empowerment at each of these levels. There were a number of recommendations as to how the program could be taken forward by gaining endorsement from national health leadership and being integrated into current health strategies and professional curricula. These results are presented as three broad themes, each theme comprising several sub-themes supported by quotes from students. To ensure anonymity, quotes are not identified by student names, but rather by numbers in brackets.

FWB content and process: Participants said FWB was very helpful and relevant to their personal, family and community health: for example, one student said "The program of FWB is very important and improve the standard of living within ourselves, family and community as a whole, for health and living condition" (7). They found the program content to be "clear and easy to understand" (1). Many participants said they liked all of the program topics: "Almost every topic covered and learned a lot of new information" (8). When asked what they didn't like about the program, all of those who answered this guestion said that there was nothing they didn't like and that everything was helpful.

Participants referred to specific topics they liked. One student said: "The thing that I like best or useful in the training was about the Life Journey and the support I get along the Life Journey" (21). Others mentioned the topics of conflict resolution, basic human needs, human qualities, emotions, grief and loss, the process of change and addressing family violence. The frequently mentioned topic most wasunderstanding relationships. Several students appreciated learning about research as part of the program: for example, one student said: "I find it useful and interesting in doing field trips, doing research and writing project proposals on Family Wellbeing" (19).

The process of FWB learning was highly valued, particularly the extent to which students participated in the learning process. They said

that they enjoyed class discussions and personal experiences. One sharing their student noted the learning associated with about others' hearing experiences and "...challenges they have conquered..." (14). They also enjoyed making class presentations: one student said that they "like the presentation- It involve us to take part" (22). There were some positive comments made about the quality of facilitation: one student said the program "was taught clearly" (4).

Whilst most students found the program process useful and helpful, a few participants found some aspects challenging. One student found it hard to talk about personal issues, feeling there was an expectation that they talk about "Some private issues that need not be exposed in public" (13). A number of students felt they needed better program resources, including handouts, videos and training modules. Other participants had ideas for improving the process of program delivery such allowing more student involvement as "...because the participants have a wealth of experience to share at present that would generate more discussion" (14). Several people noted the importance of facilitator training: "This course should be conducted by a proper Trainer who have attended the TOT (Training of Trainer)" (15); "A full two week Training of Trainers for family wellbeing must be conducted" (23). Another person suggested that if students are asked to run program sessions they need adequate time to prepare

and "...more support from the facilitator" (22). Others suggested that more time be allocated to program delivery: "...we didn't have much time to go through all the topics."(15). Whilst one thought it would be better if the training ran for "two weeks"(8), another thought better use could be made of the time available, for example participant groups could undertake group homework before presenting "...so we really understand the topics." (11).

Personal and Community Empowerment: Participating in FWB led to some important outcomes for participants. Many referred to their own personal growth and empowerment. This helped them in their relationships with others and provided a vision of how problems could be addressed at the community level. At a personal level participants reported a number of elements relating to personal growth, including enhanced self-awareness. One person said of the program that "It equips me to see my own strength and weakness" (3). Another person became more in touch with their inner qualities: "discover my inner qualities and know myself..." (2).

FWB topics provided frameworks for understanding others and building relationships, for example: "I was able to ...express my feelings openly with others" (2); "...able to listen to other people and understand the needs" (1). Participants applied these frameworks to their work situations, thereby enhancing their professional capacity. One person provided an analysis of the problems facing the PNG health system and how such problems might be tackled: "I have experienced the broad ideas in the system of management in the problem areas of how the problem in the health system was discovered."(6)

All of these outcomes helped participants to feel more confident. They spoke of feeling empowered and motivated: "It really motivated me because it empower me and build my capacity in the line of my duty" (5); "I am a changed person, because this course helped me to evaluate myself and at the same time, has empowered me to do more for other people" (18); "It will help me to solve problems in the family and the community and also lead by example." (7).

Many participants called for the program to be taken to workplaces and to communities: "...to widen the program out to the community and workplace."(7); "This program needs to go out and reach other people or health workers who really need to change" (16). They could see the program's potential to enable community capacity: "...to create a behaviour change and empowering the community to be responsible for their own health, this would involve capacity building and capacity development within families and community approaches through problem solving" (20). They highlighted the programs relevance for the PNG contemporary social context; "Their ways of living can change and adjust in a healthy way of living and

thinking" (7); and "This course is relevant for PNG and should be adopted and sustained" (10).

Taking the Program Forward: A range of measures for taking the program forward were identified. These included gaining National Department of Health (NDOH) support: "it must be communicated to the National Department of Health for sanctioning" (23). One participant suggested the program be delivered first in more stable communities: "I believe if FWB is to make any impact in the country, it has to start in the family or the particular village which is lawless free. When people start seeing some changes, it can expand". (21) Some suggested integrating the FWB program into existing village health education programs: "Problem solving by leaders, pastors and councilors and Village health worker in hygiene and health education." (6); "Can link with the Provincial health advisors- about the program so that this program can be implemented in the districts by each trainer." (22).

Participants also commented on some of the more practical issues associated with program delivery including training, funding and evaluation. One person suggested that "Training of Trainers should be conducted throughout the provinces" (15). Others thought the program could be integrated into existing training programs in public health, community nursing and education: "... be health. integrated into one course of the public health course in Community Health or other subjects" (10); "....other schools like the nursing colleges as well."(14); "This course should be included in the Education, UPNG Training Curriculum for all students to learn as well" (15). One student highlighted the need for funding: "I for one, I will go and implement this program, but I need some kind of funding to run this program" (9). Finally, the need for ongoing research and evaluation was mentioned: "...we need to do a research on this FWB...to see how this will help community" (17). The results from the open-ended evaluation data were largely confirmed by analysis of the Likert scale data regarding FWB relevance to PNG and levels of understanding and confidence to use the knowledge. After completing the FWB training, 73% of students said they understood what FWB was about, while about one third of the students (27%) were not so sure. The majority of students (95%) were interested in doing more FWB courses delivered by UPNG/JCU in the future (Q8) and indicated that they felt competent to implement aspects of FWB themselves (Q9). 90% of students felt changed, empowered and confident to use the FWB knowledge and skills after the training. All students felt that they could carry out small projects to introduce FWB to local communities as part of their study assignments (Q10). The majority of students nominated Health

Promotion/ Education (80%), Child Health (70%) and Community Health (70%) as the priority areas where they would like FWB to be incorporated.

Quantitative: Statistical analysis was conducted to examine the effects of the FWB intervention by comparing students' mean responses before and after participation in the FWB workshops. Results indicated no statistically significant variation for the three components of the FWB guestionnaire (Table 1). All three survey results revealed nonstatistically significant negative change in post vs pre-scores signifying deterioration in attitude from before the intervention to after.

**Personal Safety Survey (PSS)**: The PSS revealed staggering statistics. 43% of the students reported being the victim of actual or threatened violence in the previous 12 months; 33% reported being fearful of another person and 20% being a victim of an actual or attempted break-in (pre-survey scores). 92% of the victims knew the person who harmed or threatened them. 67% knew the person who broke in or attempted to break in. 90% knew the person who made them fearful (Fig 1). The students reported that they were less confident about personal safety at home during the day and night after the intervention, Fig 2.

Table 1: Summary of results from Wilcoxon Signed Ranks tests comparing scores (pre and post) and sensitivity to change

Measure	Pre		Post		N-ties	Z	p-value
	Mean	SD	Mean	SD			
GEM: Scale: 1 (feel least);							
5 (feel most)	4.30	0.44	4.03	1.18	25	-0.108	0.912
Australian Unity Well-Being							
Index. Scale:1 (completely							
dissatisfied); 10 (completely							
satisfied)	7.97	1.22	7.88	1.13	28	-0.330	0.741
Personal safety (Part 2) Scale:							
1 (very unsafe); 5 (very safe)	4.00	1.12	3.93	1.44	24	-0.029	0.976

\*The result is not significant at p> 0.05





{\*Error bars represent standard errors (SE). When SE bars overlap, the difference between the two mean scores is not statistically significant (p>0.05)}



#### Figure 2: Personal Safety Survey results. Part 2

{\*Error bars represent standard errors (SE). When SE bars overlap, the difference between the two mean scores is not statistically significant (p>0.05)}

#### Growth and Empowerment Measure (GEM):

The intervention had the greatest positive effect on the students' perception about things that are important to them, (Q1) "I am knowledgeable about things that are important to me", and the ability to cope with threats, (Q16) "If I was threatened by someone I knew, I am confident I could take steps to avoid conflict" .On the other hand, the students scored negatively on their self-confidence after the intervention, (Q10) "Mostly I feel shame or embarrassed" (Figure 3).

# Australian Unity Well-Being Index survey (AUWBIS):

The students scored the greatest satisfaction with being a part of their community (Q7) and spirituality (Q8), and the least satisfaction with standards of living (Q2), safety (Q6) and security (Q9), both prior to and after the FWB workshops (Figure 4). Intervention positively affected, though not statistically significant, students' views towards being part of the community (Q7), satisfaction with achievements in life (Q4) and life as a whole (Q1) (Figure 4).



{\*Error bars represent standard errors (SE). When SE bars overlap, the difference between the two mean scores is not statistically significant (p>0.05)}



# Figure 4: Australian Unity Well-Being Index survey results

{\*Error bars represent standard errors (SE). When SE bars overlap, the difference between the two mean scores is not statistically significant (p>0.05)}

#### DISCUSSION:

The aim of the study was to determine the effectiveness of the Aboriginal Australian FWB program in the context of public health training at UPNG; specifically, the effectiveness of the uptake and implementation of the program by local UPNG partners.

The qualitative feedback from students regarding the effectiveness of the program uptake and implementation was overwhelmingly positive. Students found the FWB program content and the participatory learning-by-doing style highly relevant and empowering. Topics such as basic human needs, conflict resolution, relationships, beliefs and attitudes were identified as particularly useful tools for building healthier relationships and for helping to address high levels of interpersonal violence in PNG. Students felt that participating in the FWB gave them the skills, confidence, and motivation not only to improve their own health and wellbeing but also to help family members and their service clients do the same. Overall, participants saw themselves as potential role models and FWB champions in their respective communities and work settings and offered practical suggestions and recommendations as to how the benefits of FWB might be maximised and sustained in PNG.

These qualitative findings are similar to those of the initial train-the-trainer pilot study conducted in PNG by the Australian partners. Participants in that initial pilot perceived the FWB emphasis on participation, dialogue and routine questioning of one's cultural beliefs and attitudes as bringing them back to their origin to carefully consider and take what is good from their past, combine this with ideas from the outside world and thereby create authentic new ways of tackling complex health, social, economic and political challenges facing PNG [1]. These findings are moreover similar to numerous discrete qualitative evaluations conducted in a wide variety of settings across Australia over the years [4,5,16,17]. The fact that PNG partners were able to facilitate the FWB program in their own right and achieve results similar to other FWB deliveries clearly confirms the effectiveness of local uptake and implementation. Criticisms of the delivery were in the main constructive and focused largely on logistic issues such as the need for more time to do the training properly, appropriate learning resources tailored to PNG cultural contexts and that initiatives such as FWB must be recognised, supported and resourced within PNG health and other policies and programs in order for the program to be meaningfully implemented.

While the qualitative feedback revealed a positive impact of the FWB program on participants' sense of wellbeing, the same cannot be said for the quantitative findings. In contrast, quantitative results showed only minor improvements across the three self-reported

wellbeing measures after the intervention and in some areas the situation deteriorated. The intervention had the most positive effect on the students' perception of being knowledgeable about things that are important to them, their ability to cope with threats, and the confidence that they could take steps to avoid conflict if they were threatened by someone they knew. On the other hand, the students scored more negatively on their overall confidence after the intervention.

A possible explanation for the discrepancy between the qualitative and quantitative findings is the fact that the measures were developed and validated in Australian contexts so that language and other cultural nuances may have been problematic in the PNG context. The students were however health professionals undertaking tertiary studies and hence language was unlikely to be a major issue. A more plausible explanation, based on discussions with academic staff and students who undertook the FWB training, is the timing of data collection. The qualitative data were collected immediately after the students completed the FWB training and were full of enthusiasm for the course. The follow-up (post) quantitative data on the other hand were collected between two to five months after students completed the training. Whatever the reason for lack of improvement on the quantitative measures before and after the FWB intervention, the design of measures for programs of this nature, especially across

cultural contexts, remains an issue that needs further exploration.

Despite the inconclusive quantitative results, the training in FWB did prepare staff and students to go through a crisis later that year when there was a major confrontation with the military. On that occasion (September 2013) armed soldiers entered the university campus following a previous altercation with some university students outside Port Moresby General Hospital. The university hospital campus where health and medical sciences students including the FWB participants studied was subsequently temporarily closed and students moved to the main university campus about 8.0 km across the city (from Taurama campus to Waigani campus). Many students and staff were traumatized by this experience. Even though students were traumatized, many of them expressed, through reflections, that FWB helped them to go through the crisis by effectively managing their feelings following the confrontations. Students found FWB topics such as crisis, emotions and conflicts particularly useful in coping with the crisis.

The frequency and nature of the violent confrontations between university students and the military in recent times, which in many ways reflects growing concerns regarding interpersonal violence in PNG in general [18,19], highlight both the possibilities and the limits of interventions such as FWB. On the one hand FWB gave students practical skills to build healthier relationships and with interpersonal conflicts constructively. On the other hand, the levels of trauma, fear and anger experienced by students during the military confrontation clearly show the limitations of empowerment programs such as FWB as а one-off activity. These circumstances highlight the need to routinely reinforce such skills through support networks, refresher programs and other mentoring mechanisms.

This study has some limitations. The sample size was small and the study was conducted as part of routine public health training so the timing of program facilitation and data collection had to fit in with the requirements of the faculty teaching timetable. Not surprisingly, participants raised concerns about there not being enough time to cover all the topics. Further, the study had no funding support and was conducted as part of routine teaching, with remote academic support from Australian partners. Lack of resources combined with timetable constraints meant, for example, that the Australian Unity Well-Being Index measures were not piloted before being administered to the students. Many commentators including Crossley [21] Vullimay [22] and Bray [23] noted that when transferring social and educational programs especially in the realm of comparative education and models from other contexts and settings we should be cautious as they are fraught with threats and

are bound to be incompatible. Therefore, it is encouraging that careful analysis has gone into compiling the results of both statistical data and thematic evidence and ensuring discussion, in particular the emphasis it places on the applicability of the FWB in PNG. Despite the limitations, the study is significant in the sense that it largely confirms the findings of previous PNG and Australian studies [2,3]. It shows the effectiveness of the uptake and implementation of the program by local PNG partners in the public health training context. The study also highlights the need for appropriate and welltested quantitative measures as well as dedicated research funding support in order to improve the evidence-base of social health interventions such as FWB in the context of PNG.

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	Annex 1: SURVEY QUESTIONNAIRES:
	Table I: Growth and Empowerment Measure (GEM survey questions)
#	QUESTIONS
Q1	I feel like I don't know anything
Q2	I feel like I don't know how to do much of anything
Q3	I feel slack, like I can't be bothered to do things even when I want to
Q4	I feel unhappy with myself and my life
Q5	I am held back from what I could do, there are no opportunities for me
Q6	I feel that other people don't admire or value me
Q7	Have no voice. I can't express myself. Nobody listens to me
Q8	I feel isolated and alone, like I don't belong
Q9	I am not hopeful that anything will change for me
Q10	Mostly I feel shame or embarrassed
Q11	I do things for other people all the time. I am not looking after myself or my family well
Q12	I am always worrying and nervous. I can't relax or slow down
Q13	I live in fear of what's ahead
Q14	I feel a lot of anger about the way my life is
Q15	If I was threatened by another person, I have no-one close to me who would help and support me
Q16	If I was threatened by someone I knew, I would not know what to do

	Table II: Australian Unity Wellbeing Index survey questions
#	QUESTIONS
	Thinking about your own life and personal circumstances:
Q1	How satisfied are you with your life as a whole?
Q2	How satisfied are you with your standard of living?
Q3	How satisfied are you with your health?
Q4	How satisfied are you with what you are achieving in life?
Q5	How satisfied are you with your personal relationships?
Q6	How satisfied are you with how safe you feel?
Q7	How satisfied are you with feeling part of your community?
Q8	How satisfied are you with spirituality or religion?
Q9	How satisfied are you with your future security?

	Table III: Personal Safety survey (PSS) questions
#	QUESTIONS
Q1	Have you been a victim of physical or threatened violence in the last 12 months?
Q1a	IF YES to previous question, did you know the person who harmed or threatened you?
Q2	Have you been a victim of an actual or attempted break-in in the last 12 months?
Q2a	IF YES to previous question, did you know the person who broke-in or attempted to break-in?
Q3	Has another person made you fearful over the past 12 months?
Q3a	IF YES to previous question, did you know the person who made you fearful?
Q4	How safe do you feel at home when you are alone during the day?
Q5	How safe do you feel at home when you are alone during the night?

# CASE REPORT:

# **MUCOCELE - A BENIGN LESION OF MINOR SALIVARY GLAND**

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Running Title: Mucocele

# ABSTRACT:

A mucocele is benign cystic lesion of minor salivary glands. It is usually seen in the lower lip, followed by the tongue, floor of the mouth (ranula) and buccal mucosa. Mucocele is usually a painless lesion affecting young children, adolescents and adults with no gender predilection. It occurrence may be due to trauma to the duct of the minor salivary gland or any blockade in the duct of minor salivary gland.

Keywords: Mucocele, Diascopy, Laser ablation, Cryosurgery.

# INTRODUCTION:

Mucocele are defined as mucus filled cavities, which can appear in the oral cavity, appendix, gallbladder, paranasal sinuses, and lacrimal sac [1,2]. The term mucocele is derived from a Latin word, mucus and cocele means cavity [3]. Two types of mucocele can appear: Extravasation and Retention. Extravasation mucocele results from a broken salivary gland duct and consequent spillage into the soft tissue around this gland. Retention mucocele appears due to decrease or absence of glandular secretion produced by blockage of salivary gland ducts [4, 5]. Here we report a case of mucocele of the lower lip in a female child, along with emphasis given on its histopathological features and treatment.

# CASE REPORT:

A 10 year old female patient presented with the chief complaint of a growth in the right side of the lower lip since 6 months, which was slow growing in nature and was not associated with any type of pain. Patient gave a history of having lip biting habit. Medical and dental history was non-contributory. Clinical examination revealed a well-defined solitary pale pink colored cylindrical shaped translucent nodular growth with areas of redness seen on the right side of the lower lip towards the

vermillion border. It was 4.0 mm in diameter and 8.0 mm in length. Surface of the lesion was irregular (Figure A). Based on detailed history and clinical examination a provisional diagnosis of Mucocele was made. Diascopy test was performed. After medical evaluation, and signed informed consent from the parents was obtained, an excisional biopsy was performed under local anesthesia. A local infiltrative anesthesia (2% lignocaine with epinephrine 1: 80,000; one cartridge) was infiltrated around the lesion. Before infiltration, a topical anesthetic gel for 2 minutes was applied. An excisional biopsy was done using a B.P Blade no 11 (Figure B).

Fig. A: Nodular appearance of mucocele of lower lip B. Surgical site after excision



Figures: C and D: Stained sections of excised specimen.

An analgesic was prescribed on the first post operatory day to prevent any possible pain that could result and post-operative instructions were given. Excised specimen was sent to department of Oral and maxillofacial pathology for histopathological evaluation. Histopathological section revealed parakeratinized stratified squamous epithelium, with the adjacent deeper tissue showing an area of spilled mucin surrounded by chronic inflammatory cells (Figures C and D). Considering the clinical and histological findings final diagnosis of superficial mucocele of the lower lip was given.

#### DISCUSSION:

Mucoceles may be located either as a fluid filled vesicle or blister in the superficial mucosa or as a fluctuant nodule deep within the connective tissue. Spontaneous drainage of the mucin especially in superficial lesions followed by subsequent recurrence may occur. The surface of long standing lesions may show fibrosis [6]. There are three clinical variants suggested: Superficial mucocele that is located directly under the mucosa, classic variant located in the upper submucosa, and deep mucocele located in the lower cornium.

The Pathophysiology of formation of mucocele is not clearly understood, but two etiological factors that can be considered are trauma and obstruction of the salivary gland ducts [7]. Information in the literatures indicated that oral habit such as lip biting or sucking is one of the etiologic factors for the oral lesions such as irritation fibroma and mucocele [8]. Our reported case presented with lip biting habit.

There are various differential diagnosis which include Papilloma, Ranula, Benign or malignant salivary gland neoplasms, Oral Hemangioma, Oral Lymphangioma, Lipoma, Oral lymphoepithelial cyst, Gingival cyst in adults, Soft tissue abscess and Cysticercosis (parasitic infection) [9] . After physical examination of the surface of the lesion in our reported case we had considered papilloma and hemangioma as the differential diagnosis. Mucoceles spontaneously resolve, may especially in infants and young children. Mínguez et al [10] conducted concluded saying that approximately 44% of mucoceles in children spontaneously resolved after an average of 3 months. Diascopy test should be performed to rule out if the lesion is vascular, non-vascular or haemorrhagic [11]. This test helps in differentiating mucocele from any other hemangioma. Other investigations which can be performed are Fine needle aspiration cytology and excisional biopsy [12]. Diascopy test was performed in our reported case to rule out hemangioma. Marsupialisation will only result in reoccurrence [6]. Surgical excision with removal of the involved accessory salivary gland has been suggested as the treatment of choice. When symptoms are absent aspiration of the lesions and periodic follow up for up to 6 months have been suggested as an alternative to surgery [13]. It is very important that the surgically excised specimen be sent for histopathological analysis to rule out other salivary gland neoplasms. Other treatment approaches such Laser ablation. as cryosurgery, and electrocautery have been used for conventional mucocele with variable success [14, 15].

#### CONCLUSION:

Mucocele are relatively common benign salivary gland neoplasm. The findings in our present case support the information in the published literature that the occurrence Mucocele is mainly due to trauma and habitual lip biting. School awareness programmes should be organised to educate the young children and their parents about one of the consequences of lip biting or sucking. Extra care must be taken for patients undergoing orthodontic treatment. Recurrence can occur if the accessory salivary gland is traumatised during surgical treatment of the lesion. Quality care must be taken while surgically excising the lesion and the causative factors should also be taken care of, minimized or prevented.

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# A LARGE FIBROMA – A CASE REPORT

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# ABSTRACT:

Isolated soft tissue overgrowths in the oral cavity generally demonstrate a benign, exophytic and reactive nature and are rarely neoplastic. Fibroma is the most common tumor of the oral cavity which occurs mostly in response to trauma or chronic irritation. True fibromas of the oral cavity are rare. We report a case of large fibroma in the right pterygomandibular raphe region in a sixteen year old male patient.

Keywords: Irritation fibroma, reactive hyperplasia, pterygomandibular raphe

# INTRODUCTION:

Fibromas are benign tumors that are composed of fibrous or connective tissue. They can grow in all organs, arising from mesenchyme tissue [1]. Isolated or focal intraoral soft tissue enlargements most commonly occur as reactive hyperplasia and are seldom neoplastic in origin. Fibroma is a commonly occuring benign tumour of the oral cavity. In most cases fibroma presents as a reactive hyperplasia of fibrous connective tissue in response to local trauma [2]. The occurrence of irritation fibromas among the South Indian population was found to be 39.1 percent [3]. Chronic irritation or trauma are the most common causes for oral fibroma. True fibromas rarely occur in the oral cavity and demonstrate continuously enlarging slow growth not necessarily arising from the site of potential trauma [4]. It was first reported in 1846 as fibrous polp and polpus [5]. Common site of occurrence is buccal mucosa along the occlusal plane, labial mucosa, gingival and tongue [6]. These benign oral lesions are usually asymptomatic, sessile or pedunculated firm mass usually found in the fourth to sixth decade [5]. We report a case of fibroma in a sixteen year old male patient in relation to the right pterygomandibular raphe region.

#### CASE REPORT:

A 16 year old male patient reported to our department with a chief complaint of growth behind the lower right back tooth of the jaw since 2 years. Patient was apparently normal 2 years back after which he noticed a growth in the lower right back tooth region of the jaw which was gradual in onset. Initially it was very small in size and had gradually progressed to the present size. There was no difficulty in eating or swallowing. Occasionally the growth was trapped between the upper and lower teeth while chewing food. It was not associated with pain and there was no history of trauma to the region or any bleeding from the growth. There was no history of similar growth elsewhere in the body. The patient had not undergone any treatment earlier for the same. The past medical and dental history was non contributory. On extraoral examination regional lymph nodes were not palpable. Intraoral examination showed a solitary well defined growth on the right pterygomandibular raphae region just distal to the retromolar area around 2x2 cm in size (Figure1). On occlusion the upper second molar was impinging on the growth. The growth was pedunculated and roughly spherical in shape. The overlying mucosa and surrounding mucosa were pale pink in colour. On palpation, the growth was

non tender, soft in consistency, pedunculated and freely mobile. There was no bleeding on palpation.

Based on the clinical findings a provisional diagnosis of fibroma in the right pterygomandibular raphe was given. Neurofibroma and minor salivary gland tumor were considered in the differential diagnosis. The patient was advised that hematological examination and excisional biopsy of the lesion should be done. After obtaining an informed consent from the patient, surgical excision of the lesion was done under local anesthesia and wound 2). was sutured (Figure Histopathological examination of the lesion revealed the presence of squamous epithelium with short rete ridges. The overall thickness was reduced and atrophic. The connective tissue comprised of proliferating bundles of collagen fibres, scanty inflammatory cells, very few blood vessels which is suggestive of fibroma (Figure 3 and Figure 4). Periodic recall and follow up is being done every six months for the past one year and there has been no recurrence.

#### DISCUSSION:

Fibromas are the most common benign soft tissue tumors seen in the oral cavity. They are also known as irritation fibroma, traumatic fibroma, fibrous nodule, fibro-epithelial polyp [6,7]. True fibromas of the oral cavity are rare. Barker and Lucas [8] recognised two cases of true fibromas from 171 specimens of localised fibrous overgrowths. Unlike benign fibrous neoplasms, reactive or irritational fibroma

usually has an etiology that is a source of irritation [3].



Figure 1: Fibroma in the right pterygomandibular raphe



Figure 3: Excised specimen which was 2x2cm in size

In the present case we did not identify any source of irritation for the lesion to occur. According to Barker and Lucas [8], irritational fibroma exhibit a pattern of collagen arrangement depending on the site of the lesion. There are two types of patterns, radiating pattern and circular pattern. In the radiating type, the fibres radiate towards the epithelium from the base of the lesion. While the cicular type shows a central mass of



Figure 2: After excision, Post surgically wound sutured



Figure 4: Photomicrograph showing dense interlacing collagen fibres

disoriented fibres surrounded by a peripheral layer of collagen fibres running beneath and parallel to the overlying epithelium. Thus, they hypothesized that the radiating pattern appears when there is greater degree of trauma and in sites that are immobile in nature (eg. Palate) while lesser trauma induces the circular pattern that occurs in sites that is flexible in nature (eg Cheek) [8]. Barker and Lucas further stated that irritation fibroma can be differentiated from true fibroma by pattern of collagen arrangement [8]. True fibroma does not exhibit any pattern and is encapsulated [6].

However, case presented our as а pedunculated and uncapsulated growth with scanty inflammatory cells and blood vessels pointing towards irritation fibroma that does not have potential risk for malignancy. Treatment of irritation fibroma comprises elimination of the causative factors, scaling of adjacent teeth, surgical excision along with involved periodontal ligament and periosteum to reduce the possibility of recurrence [6]. Recent treatment options include electrocautery, Nd:YAg laser, flash lamp pulsed dye laser, cryosurgery, intralesional injection of ethanol or Sodium Tetradecyl Sulfate sclerotherapy [6]. A large irritation fibroma as seen in our case should be differentiated from other solitary soft tissue growths. Based on the site of the growth neurofibroma and minor salivary gland tumor were considered in the differential diagnosis in our case as the lesion was pale, firm and non tender. Nuerofibroma was ruled out as no other characteristic features mentioned in the diagnostic criteria for neurofibroma were evident. Minor salivary gland tumor was ruled out as the growth was pedunculated.

# CONCLUSION:

Fibromas in most cases are benign conditions whose diagnosis is based on clinical and

histopathological examinations. Since oral cavity is a common site for reactive soft tissue lesions it can cause a diagnostic dilemma for an inexperienced clinician because of similar clinical presentations.

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#### **RECURRENT UNICYSTIC AMELOBLASTOMA IN A 20 YEARS OLDFEMALE – CASE REPORT**

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#### ABSTRACT:

Ameloblastoma is a slow growing, persistent and locally aggressive neoplasm of epithelial origin. According to the WHO ameloblastoma are classified into conventional, unicystic and peripheral. Unicysticameloblastoma refers to the cystic lesion that show clinical, radiological or gross features of a mandibular cyst but on histological examination show typical ameloblastomatous epithelium lining part of cyst cavity with or without luminal and or mural tumor growth. Moreover recurrence of unicysticameloblastoma may be long delayed and long term postoperative follow up is essential. Here we are presenting a case of recurrent unicysticameloblastoma in the right lower mandibular region in a 20 years old female patient.

Keywords: unicysticameloblastoma, recurrence, mandibular cyst

# INTRODUCTION:

Ameloblastoma is reported to constitute about 1-3% of tumors and cysts of the jaw [1,2]. Although it is considered a benign tumor, its clinical behavior may be regarded as lying between benign and malignant [3]. It often presents as a slow growing painless swelling causing expansion of the cortical plates and infiltration of soft tissue. There is often delay in the diagnosis because of its slow growing nature [4]. Unicysticameloblastoma is a less encountered variant of the ameloblastoma, accounting for 10-15% of all intra osseousameloblastomas [5,6]. Hong et al showed that the histopathology of an ameloblastoma is significantly associated with recurrence[7]. It was shown that the follicular, granular cell and acanthomatous types have a relatively high likelihood of recurrence, in contrast, the desmoplastic, plexiform and unicystic types show a relatively low potential for recurrence. Recurrence rate of 10 -20% has been reported after enucleation and curettage of unicysticameloblastoma. This is considerable less than 50 - 90% recurrence rate noted after curettage of conventinal solid and 43 multicysticextraosseous-ameloblastoma [8,9]. We present a case of large recurrent unicysticameloblastoma in the mandible in a 20 years old female.

#### CASE REPORT:

A 20 years old female reported to our College with the complaint of swelling (figure1) on the right side of the mandible of 2 weeks duration. There was no associated difficulty in opening the mouth, chewing or articulating. She had undergone surgical removal of unknown lesion under general anaesthesia 5 years back, which had presented as a swelling and begin spontaneously without any historyof trauma or infection. Root canal treatment was also done in relation to five teeth. Patient reported to our department with the complaint of swelling which increased gradually since two weeks in the same region (right lower mandibular region). On examination, extraorally there was solitary diffuse swelling seen over right lower mandibular region extending anteroposteriorly from about 2 cm lateral to midline and about 3 cm anterior to the angle of mandible. The skin over the swelling appeared to be normal. Intraorally there was mild obliteration of buccal vestibule on right mandibular region. There was

expansion of buccal and lingual cortex. The lesion was non-compressible and non-pulsatile. No neck nodes were palpable. Her medical history was unremarkable.

An orthopantomogram (OPG) showed (fig 2) solitary unilocular radiolucency extending posteroanteriorly from the distal aspect of 47 to distal aspect of 42. Superiorly it extended from the mid radicular level to the lower border of the mandible. Inferior border of mandible was intact. Radiopacity was seen in the pulp canal in relation to 41, 42, 43, 44, and 45 indicating obturation which was done 5 years back. Root resorption was seen in relation to 44,45,46. CT scan showed (figure 3 & 4) that cystic lesion was confined to the mandible and there was perforation of lingual and buccal cortex. The patient was treated surgically under General Anesthesia. Surgical enucleation (fig 5) of cystic lining along with extraction of 42, 43, 44, 45,46,47 was done followed by chemical cauterization with Carnoy's solution. Primary closure was done. The excisional specimen showed histological features of unicysticameloblastoma which had luminal growth. Follow up was done after 6 months which showed signs of bony healing with reduction in the size of radiolucency.



Fig: 1. Swelling in the right side of mandible



Fig. 2: Panaromic radiograph showing unilocular radiolucency



Figs 3 & 4: 3D reformatted CT image of buccal and lingual view showing perforation of buccal and lingual cortex.



Fig 5: intraoperative picture showing intact lower border of mandible



Fig 6: post operative photograph

#### DISSCUSSION:

Ameloblastoma is a slow growing, persistent and locally aggressive neoplasm of epithelial origin accounting for 10% out of 30% of odontogenic tumors [16]. According to WHO, ameloblastoma are classified into conventional, unicystic and peripheral. Unicysticameloblastoma was first described by Robinson and Martinez in 1977, referring to those cystic lesion that showed clinical, radiological or gross features of a mandibular cyst [16]. It is a rare type of ameloblastoma accounting for about 5-10% of all intraosseous-ameloblastoma[5,10].

Unicysticameloblastoma is believed to be less aggressive and responds more favorably to conservative than solid surgery or multicysticameloblastoma [6]. Leider et al [11] proposed three pathogenic mechanisms for the evolution of unicystic-ameloblastoma. They are Reduced enamel epithelium, From dentigerous cyst and Due to cystic degeneration of solid ameloblastoma. Histologically the minimum criteria for diagnosing а lesion as unicysticameloblastoma is the demonstration of a single cystic sac lined by odontogenic (ameloblastomatous) epithelium often seen only in focal areas. Unicysticameloblastoma should be differentiated from odontogenic cysts because the former has higher rate of than the latter. In recurrence а clinicopathological study of 57 cases of unicysticameloblastoma, Ackermann [12] classified them into three histological groups. Group1: luminal unicysticameloblastoma(tumor confined to the luminal surface of the cyst); intraluminal/ plexiformunicystic-Group 2: ameloblastoma( nodular proliferation into the lumen without infiltration of tumor cells into the connective tissue wall) and Group 3: mural unicystic-ameloblastoma (invasive islands of ameloblastomatous epithelium the in connective tissue wall not involving the entire epithelium). Another histological sub-grouping by Philipsen and Reichart [5] has also been described, they are: Subgroup 1: luminal unicystic-ameloblastoma; Subgroup 1.2: luminal and intraluminal; Subgroup 1.2.3: luminal, intraluminal and intramural and Subgroup 1.3: luminal and intramural. The unicysticameloblastoma diagnosed as subgroups 1 and 1.2 can be treated conservatively (careful enucleation) whereas sub group 1.2.3 and 1.3 showing intramural growth requires radical resection as for a solid or multicysticameloblastoma [13]. Following enucleation, vigorous curettage of the bone should be avoided as it may implant foci of ameloblastoma more deeply into bone. Chemical cauterization with carnoy's solution is advocated for also subgroup 1 and 1.2.Subgroups 1.2.3 and 1.3 have a high risk for recurrence requiring more aggressive surgical procedure. This is because the cystic

wall in these cases has islands of ameloblastoma tumor cells and there may be penetration into the surrounding cancellous bone [14,15,13]. In the present case since it was a recurrent unicysticameloblastoma in a young patient which was not involving lower border of mandible (fig 5), enucleation along with chemical cauterization was done. Histopathology showed unicysticameloblastoma with luminal growth. Follow up after 6 months showed no recurrence.

# CONCLUSION:

Whatever surgical approach the surgeon decides to take, long term follow up is mandatory, as recurrence of unicysticameloblastoma may be long delayed.

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# CONGENITAL MISSING PERMANENT TEETH: A CASE REPORT

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Running Title: OLIGODONTIA

# ABSTRACT:

Dental agenesis is one of the common developmental anomalies in humans. It is sometimes associated with several syndromes. Different authors have used various terminologies to describe missing teeth, such as, Oligodontia, Anodontia and Hypodontia. Oligodontia is the developmental absence of six or more teeth, excluding the third molars. Oligodontia can have an isolated presentation or may present as part of certain syndromes one of them being ectodermal dysplasia. This present case describes missing of the permanent teeth which may be familial and with no apparent systemic abnormalities.

Keywords: Agenesis, Anodontia, Developmental Anomalies, Hypodontia, Oligodontia.

#### INTRODUCTION:

Dental agenesis or missing teeth is a developmental anomaly seen in isolated manner or associated with various syndromes in the patients. Different terminologies used to describe missing teeth are oligodontia, anodontia and aplasia of tooth [1]. Oligodontia is a condition consisting of congenital absence of six or more teeth excluding the third molar [2]. Prevalence of oligodontia is estimated to be around 0.1% to 0.3% worldwide according to Polder et al [3]. It may be either unilateral or

bilateral involving a single tooth, group of teeth or entire dentition [4]. Here we present a case of missing teeth in an adult male with positive family history and no association with syndrome.

#### CASE REPORT:

A 35 year old male patient presented to the outpatient department of oral medicine and radiology with complaints of missing teeth since childhood. No other complaint was given by the patient. He did not give any significant past medical or dental history suggestive of any syndrome. Family history revealed another male sibling in the family having the same condition since childhood. Personal history revealed chewing gutka 6 times daily since 6 years. General examination was normal and vitals were stable. On intraoral examination 16 teeth were absent maxillary right (lateral incisor, canine, first premolar, third molar), maxillary left (lateral incisor, canine, first premolar, third molar), mandibular left(central incisor, lateral incisor, second premolar, third molar), mandibular right (central incisor, lateral incisor, first molar, third molar) and root stump with respect to mandibular right second molar was seen [Figure 1]. Severe staining was seen. Patient had less number of permanent teeth as per age.

Based on these clinical findings the patient was advised to do an Orthopentomogram (OPG) investigation. The result of the OPG confirmed congenital missing permanent tooth bud [Figure 2]. Thus a diagnosis of non syndromic Oligodontia was made and the patient was referred to the department of prosthodontics for further evaluation and possible prosthetic replacement of the missing teeth.



Figure 1: A: shows missing mandibular Anterior teeth; B: shows missing maxillary teeth.



Figure 2: Orthopentomogram (OPG) showing missing permanent teeth buds

#### DISCUSSION:

Dental agenesis is mostly an underlying developmental defect in humans. A tooth is said to be congenitally absent or missing if it has not erupted in the oral cavity and radiograph evidence is also suggestive of the same [5,6]. When the number of such missing teeth is more than six excluding the third molar the term given is oligodontia [2]. Prevalence decreases as the number of missing teeth increases and more commonly seen in females than males [7]. In the present case the condition was seen in an adult male with unequal distribution of missing teeth.

Oligodontia is also seen in association with various syndromes, which include, ectodermal dysplasia, incontinentia pigmenti, Down syndrome, Rieger syndrome just to name a few. Oligodontia as well as hypodontia (lack of one or more permanent teeth) are highly heritable conditions associated with mutations in the AXIN2, MSX, PAX9, EDA and EDAR genes as reported by Bergendal et al [8]. The present case also reflected some degree of genetic preponderance as the other sibling was also affected by the same condition.

Environmental factors like virus infections, toxins and radio or chemotherapy are also said to be the cause of missing permanent teeth. These were not seen in our case as indicated by the history given by the patient. Careful treatment and planning to avoid long term complications in the patient is needed [9]. In severe cases prosthetic procedure may be required as was done in this case because the patient was an adult with partially edentulous maxilla and mandible.

# CONCLUSION:

Oligodontia patients of any age group should be identified clinically and a multidisciplinary approach towards rehabilitation of the patient should be done. This may help in avoiding the adverse implications associated with this condition.

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#### BILATERAL PREGNANT TEETH WITH RADICULAR CYST: A CASE REPORT

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Running Title: Dens invaginatus

#### ABSTRACT:

Dens indente or Dens Invaginatus is a rare developmental anomaly of the tooth affecting mostly the permanent maxillary lateral incisors and less commonly the other permanent teeth and the primary dentition. Sometimes this invagination extends to pulp chamber resulting in pulpal and periapical pathology even in absence of dental caries. A radicular cyst is one of the furthermost everyday odontogenic cysts of the anterior maxilla, not regularly comprehended in youth. They are found mostly at the apices of the tooth, lateral surface of the roots and remains in the jaw after removal of the offending tooth. Here, we present a rare case of anomalous development of maxillary permanent lateral incisor with bilateral radicular cyst.

Keywords: dens in dente, radicular cyst, bilateral, pregnant tooth.

#### INTRODUCTION:

Dens in Dente (DID) is a rare developmental anomaly which is also called as "dilated composite odontome" or tooth within tooth. It is characterized by the in-folding or inversion of the enamel into the tooth structure, during the early stages of tooth bud formation [1, 2]. DID is commonly diagnosed as an incidental radiographic finding unless the patient presents with pain or swelling associated with the involved tooth. The incidence of DID is reported to range between 0.04% and 6% with a higher male predilection than females [3]. Clinically, they reveal a deep fissure or pit on the lingual surface of anterior teeth and an occlusal pit and a bulge on the posterior teeth. Radiographic examination is the most realistic way to diagnose such anomalies [1,4]. We present a rare case of bilateral radicular cyst with dens in dente in relation to lateral incisors of the maxilla.

#### CASE REPORT:

A thirty one year old male patient came to the department of oral medicine and radiology for a routine dental examination. Patient gave a history of swelling on the maxillary anterior region before three months, for which he had taken medication and the swelling subsided after taking medications. There was no significant medical history. Extraoral examination revealed abnormalities. no Intraoral examination revealed slight cuspal anomaly in the maxillary lateral incisors bilaterally with a 'Y' shaped groove on lingual side. Tooth did not respond to vitality test. Occlusal radiograph show in folding of radioopacity seen in the incisal 1/3rd of the crown extending up to the cemento enamel junction. A well defined radiolucency was seen in the periapical region of right lateral incisor and left lateral incisor extending from the mesial root surface of central incisor to mesial root surface of canine bilaterally. The radioluceny had uniform internal architecture surrounded by sclerotic border (Figure 1). This led us to diagnosis of the tooth as DID with bilateral radicular cyst.

Root canal treatment was initiated and completed in one visit. Post operative radiograph was taken to confirm the integrity of the root canal filling (Figure 2). After which an

carried out. For apicectomy was also enucleation, greater palatine, and nasopalatine nerve blocks were administered with 2% Local anesthesia, А Labial full thickness mucoperiosteal flap was elevated to expose the area of lesion. Existing cortical bone window was expanded and underlying pathology was exposed and sufficient space was made for thorough curettage. Primary closure was done with 3-0 black silk (Figure 3). A specimen was sent for histopathological examination. Postoperative instructions were given and the patient was prescribed antibiotics and antiinflammatory drugs. After one week the patient was recalled. Histopathological examination revealed a capsule and a lumen, capsule was fibrosed and lined by stratified squamous nonkeratinized epithelium showing focal the proliferation confirming diagnosis of radicular cyst.

#### DISCUSSION:

DID occurs rarely in the primary teeth but frequently in the permanent dentition and has a general prevalence of 0.04–6% [5,6,7]. The more severe forms however are less common. There is a 3 : 1 female predilection [5,8]. Radicular invagination usually results from an infolding of Hertwig's root sheath and originates within the root after the development is complete. The dens invaginatus usually presents a bizarre radiographic appearance.



Figure 1: Occlusal radiograph with DID in relation to right and left lateral incisors with radicular cyst



Figure 2: After the completion of Root Canal Treatment in relation to right and left lateral incisors





Figure 3

Figure 3: Surgical windows on the labial aspect with the apex of both right, left lateral and central incisors during apicectomy and the suturing done after the procedure.

The present case depicts the morphologically and anatomically altered tooth structure. In DID the invagination area is separated from the pulpal tissues with a thin layer of dentin and frequently communicates with the oral cavity. This allows the entry of irritants and microorganisms, which usually leads to infection and necrosis of the pulpal tissue and may lead to a periodontal or periapical abscess with continuous ingress of irritants. Ohelers classified DID into three stages [9,10]

Type 1: Invagination ends as a blind sac within the crown; Type 2: The invagination extends apically beyond the cemento-enamel junction; Type 3: The invagination extends beyond the cemento-enamel junction, and a second "apical foramen" is evident.

The pathogenesis of radicular cyst has been portrayed as encompassing of three definite

phases: phase of Initiation, cyst formation and the enlargement. Cyst is assumed to be produced by multiplying of the epithelial cell rest of malassez in inflamed periradicular tissues. Nearly all radicular cysts are lined completely or in the fragment by nonkeratinized stratified squamous epithelium. The lining may be, intermittent in quantity and vary in depth from one to 50 cell strata. It's quite unusual to see this lesion in a bilaterally symmetric fashion, as was seen in our case. Several treatment modalities are available for radicular cyst, such as, surgical endodontic management, extraction of the aberrant tooth, enucleation with initial resolution. and marsupialization shadowed by enucleation. In this case, surgical enucleation was desired and was implemented on both sides [11].

#### CONCLUSION:

Dens in Dente (DID) can be recognized before the eruption of the tooth from periapical radiographs. These teeth should be treated prophylactically as soon as possible after tooth eruption. Early diagnosis and intervention can prevent pulpal necrosis and the potential loss of tooth. This report highlights on the occurrence of symmetrical dens n dente with bilateral radicular cyst, which is rare of its entity and shows the importance of radiographic examination prior to the diagnosis.

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# LETTER TO THE EDITOR:

# USE OF TELEPATHOLOGY FOR HISTOPATHOLOGICAL DIAGNOSIS IN PAPUA NEW GUINEA: A TEMPORARY SOLUTION TO SHORTAGE OF PATHOLOGISTS

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# Dear Editor,

Rapid advances in information communication technologies (ICT) have enabled improvements in telepathology. Telepathology has wide applications in developing countries and can be used for primary diagnosis, second opinions, teaching and research [1,2]. Examples of countries that have set up telepathology systems include Solomon Islands, Bangladesh and Cambodia [1]. Papua New Guinea (PNG) has a population of nearly 8 million people with only 16 pathologists and 14 of them are based in Port Moresby, the capital city of PNG. Port Moresby is not connected by road to other towns in PNG hence the only mode of transportation is by air leading to increased costs of transporting surgical specimens to Port Moresby General Hospital (PMGH) where the country's only histopathology service exists.

Due to the shortage of pathologists to provide histopathological cancer diagnosis, telepathology has been suggested as a possible solution [3]. A survey by Albert and Garbett showed 70% of PNG health workers interviewed indicated telepathology would be extremely useful in PNG and 64% specified they were willing to access telepathology results using a secure network [4]. However, to date no telepathology initiative has emerged in PNG.

There are different types of telepathology systems; these include static telepathology, dynamic telepathology and hybrid telepathology [1]. The simplest and cheapest type is the static telepathology that involves capturing still images of a histopathology slide and sending it via an email or web portal to pathologists at distance locations that are linked to the network. However, static telepathology is limited by image selection and image quality. In an international telepathology validation study, the diagnostic concordance of static images versus glass slide diagnosis varied between 82.9% and 92.1% [5]. In that same study 60% of the errors were related to image selection and image quality [5]. Halliday et al [6] analysed 171 static images submitted to an international telepathology service and found the concordance rate to be 88.2%. However, the concordance rate for clinically important cases was 96.5% [6]. The study also found inappropriate image selection, sampling biases bv referring pathologists and underestimation of the complexity of the cases by reporting telepathologists that negatively influenced diagnosis by static images [6]. With advanced telepathology technologies, the diagnostic concordance can reach 90% and 100% Although telepathology [7]. is increasingly being implemented in developing and developed countries, it has limitations that vary according to the type of tissue selection and technology used [2]. In resource limited major challenges settings, limiting the establishing of a telepathology service include financial investment in the telepathology hardware and software, dedicated trained personal and the ICT infrastructure in the country [8]. These limitations, however, have not significantly hindered implementation of telepathology services globally as evidenced by

the increased implementation of different forms of telepathology [2].

Our research team has recently developed a user friendly internet based telepathology system that we have named "ePathPG" that can be used in PNG. The system uses a webbased image management database that registered pathologists can access remotely to make histopathological diagnosis based on uploaded images. This system uses a static image telepathology model that is user friendly. Registered users can access the images using standard internet connection services or via a 3G or 4G mobile network using smart phones and android devices.

However, the current ePathPG version is a prototype and there is a need to validate it before the system can be accepted for routine remote histopathological diagnosis. We are in the process of implementing a validation study to evaluate the diagnostic concordance of ePathPG using guidelines established by the Telepathology Guidelines Committee of the Canadian Association of Pathologists [9]. The results of the validation study will help refine ePathPG and improve it to an acceptable level for routine use. We are of the opinion that telepathology has a role in the management and control of cancer in PNG in the short to medium term, particularly with respect to improved result-turn-around time, and we think telepathology models for use in PNG needs further exploration.

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Gillett JE. The health of women in Papua New Guinea. PNGIMR: Kristen Press, 1991

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