Neglected Tropical Disease (NTD) in Fiji
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3. The manuscript is the author's own original work, and the authors are the sole authors of the manuscript.
4. The primary author is willing and able to work with FJPH editors in revising the submission if it is selected as a likely candidate for publication.

Submission Types
1. Original scientific Research - Research - based works addressing a specific area of public health or any other general topic in health
2. Abstracts – structured abstracts for original research and
3. Perspectives –Reviews, Opinion pieces that analyze or discuss a recent issue or development in public health
4. Field notes –Journal-style pieces, with a more personal voice, based on direct work in the field

Formatting
• All manuscripts should be submitted as double-spaced, size 12, Times New Roman font in microsoft Format (.doc or .docx only).
• Do not include the name of the manuscript's authors any pages except the title page.

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Tables, Figures and Images
• Tables, figures and images should be the original work of the manuscript's authors and should be included at the end of each manuscript.
• Captions should describe what the table/figure/image shows and the conclusion that should be drawn.
• Labels and axes should be clearly marked and readable. All tables, figures, and images should be submitted in high resolution please.
• References

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The theme of this issue of FJPH, Neglected Tropical Diseases (NTDs) is very timely as it is just on the heels of the adoption of resolution on all 17 NTDs that are globally focussed at the 66th World Health Assembly (WHA) concluded in May 2013 in Geneva.

The WHA resolution endorsed by the health ministers around the world including the Hon Minister of Health, Fiji, urged a vigorous response to all 17 NTDs by Member States to control or eliminate these diseases in order to reach the 2020 targets outlined in Accelerating Work to Overcome the Global Impact of Neglected Tropical Diseases: A Roadmap for Implementation.

The Western Pacific Region (WPR) is endemic for 13 of these 17 NTDs and 28 of the 37 countries and areas of the region have at least one NTD as a public health problem. The Pacific Island Countries (PICs) have reported 8 of these NTDs namely, trachoma, yaws, leprosy, lymphatic filariasis (LF), dengue, buruli ulcer, taeniasis and soil-transmitted helminthiasis (STH). Fiji has been endemic for trachoma, leprosy, LF, dengue and STH.

WHO’s Regional Committee for the Western Pacific that includes all health ministers in the WPR, in 2012, passed a resolution on NTDs and endorsed a Regional Action Plan for NTDs in the WPR (2012 – 2016), a roadmap to help countries in the region control or eliminate NTDs. Pacific Health Ministers meeting held in July 2013 also discussed and upheld NTDs as a group of priority diseases in the PIC highlighting the need for developing action plans specific for PICs.

The global NTD roadmap to 2020 and the WPR regional action plan bring all NTDs into one platform and promote the use of five public health strategies to control, eliminate or eradicate NTDs. These strategies are: preventive chemotherapy; innovative and intensified disease management; vector control and pesticide management; safe drinking water, basic sanitation and hygiene services and education; and veterinary public health services. Most of them are relevant to Fiji and are being implemented, led by the Ministry of Health.

The FJPH overall, and this issue on NTDs in particular, provides an important platform to disseminate information on NTDs and issues relevant to Fiji. The articles in this issue cover a wide range of issues of NTDs relevant to Fiji and are useful to a wide scientific audience both within and outside Fiji. The commentary on Dr. Jona Mataika is a fitting tribute to a scientist and a medical doctor who has contributed greatly and whose professional life was dedicated to finding solutions for people suffering from NTDs not only in Fiji but around the world.
Retrospective study on the effect of Climate variability on the incidence of dengue in Fiji from 2003 to 2007

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INTRODUCTION

Dengue Fever (DF) and Dengue Hemorrhagic Fever (DHF) are the most important vector-borne viral diseases in the world. Around 50-100 million cases appears each year putting 2.5 billion people at risk of suffering this debilitating and sometimes fatal disease (Diaz, 2009). The disease has rapidly become a major public health threat in most tropical and subtropical countries. The World Health Organization has estimated that out of this 2.5 billion world population in over 100 countries, two-thirds who are currently at risk reside in the Asia Pacific Region (World Health Organization, 2009).

Dengue fever and DHF is a major public health concern in Fiji and the South Pacific. In the last three decades, an estimated 50 outbreaks of dengue fever have occurred in the 22 Pacific Island Countries and Territories (PICTs) with six-major region wide outbreaks since 1970. Dengue fever’s epidemiology is rapidly evolving, with increased frequency in outbreaks and expansion to new geographic areas. At least all four serotypes of the dengue virus (1, 2, 3 and 4) have caused outbreaks in PICTs but only a couple has featured in the larger epidemics. However, it is usually one major serotype that is identified as a cause of a region-wide epidemic (Singh et al 2006)

The Fiji Islands has also had its share of dengue fever outbreaks. A major dengue outbreak that resulted in loss of lives, substantial health care stress and considerable economic costs occurred from 1997 – 1998 and 2003. The 1998 dengue fever outbreak affected over 24,000 people (including 1,600 hospitalizations) with an estimated cost of control and patient management at approximately F$12million(Narendra S, et al., 2006).

The devastating effect of dengue fever in Fiji is attributed to unplanned development, poor water storage and unsatisfactory sanitary conditions, all of which contribute to the proliferation of the main vector, the Aedes Aegypti that has adapted to living close to human habitation. The female Aedes Aegypti feeds during the day and prefers human blood to that of animals.

Global climate change is recently recognized as a precipitating factor in the frequency and intensity of dengue fever outbreaks in the region. There is increasing evidence from affected countries albeit different methodologies of investigation of an association between climate variation and vector-borne diseases (IPCC, 2001). Dengue fever is the most important viral vector borne disease in the world that is influenced directly or indirectly by changing climatic conditions (WHO, 2000). Climate variability refers to the way climate fluctuates yearly above or below a long-term average value (Intergovernmental Panel on Climate Change (IPCC), 2001). It consists of two parts: an average and range that complement each other. Climate variability includes temperature, rainfall and humidity. The dengue virus and its predominant mosquito vector, Aedes aegypti are determined by these variable climatic conditions. The seasonal nature of disease transmission reflects the influence of climate on the transmission cycle. Rises in temperature increase Aedes aegypti abundance by increasing development rate, decreasing the length of reproductive cycles, stimulating egg-hatching and providing sites for egg deposition(Keirans & Fay, 1968; Pant & Yasuno, 1972; Ruedal et al 1990).
The environmental conditions in tropical and subtropical regions also contribute to increased populations of mosquitoes and efficiency in the transmission of the dengue virus. The wet and often humid conditions in the tropics are an ideal environment for the vector to breed in pools of standing water and a warm ambient temperature that increases adult feeding behavior and mortality, rate of larval development, and speed of virus replication (Focks et al, 1993). The virus replication cycle in the mosquito, referred to as the extrinsic incubation period, is temperature dependent and also sensitive to changes in rainfall. Transmission intensity is regulated by the weather and climate (Michael, Francesca & Gregory, 2009).

The prevention of dengue fever depends largely on the control of the local vector for the Dengue virus in the absence of an effective vaccine or drug treatment. Vector control measures are the best available methods for reducing disease incidence through the reduction of breeding sites and use of insecticides during epidemics. These common measures have succeeded in reducing mosquitoes in some regions, but maintaining the strategy in the long term continues to be a challenge (Simon et al., 2002).

Since seasonal and climate variability have a role in the abundance of the vector and the disease, the understanding of the relationship between the pathogen, the vector and host can contribute to the development of early warning systems for dengue fever outbreaks (Mueller et al 2009). The other human environmental factors that need to be considered such as population dynamics, immune status, urbanization, health care systems and socio-economic factors also play a role in the transmission of the disease and the extent of morbidity or mortality in the population. However, environmental variation, represented by weather, is a particularly poorly understood, albeit potentially important piece of the puzzle in disease reduction (Mueller et al., 2009).

This study aims to describe the potential impact of temperature, humidity and precipitation on dengue incidence from 2009 to 2012 in Fiji, identifying the extreme climatic events during this period. The dengue fever outbreaks are mapped using, Geographical information systems (GIS).

**METHODOLOGY**

The study is a retrospective review of climate variability data from the Fiji Meteorology Service (FMS) and dengue surveillance data from the Ministry of Health, health information unit. The incidence of dengue fever is compared against demographic variables e.g. gender, ethnicity and basic climatic parameters. Secondary data on dengue cases (serologically laboratory confirmed) is collected from the Fiji Centre for Communicable Disease Control (FCCDC) at Mataika house and corresponding residential location of cases is obtained from the Patient Information System (PATIS).

Weather or climate variability data include maximum temperature (average), precipitation/rainfall (average), and relative humidity (average). The climate variability data for the four (4) administrative divisions is averaged for the whole country to provide a uniform representation.

The weather variability data and demographic data are entered into a Microsoft Excel 2010 sheet and analyzed using pivot tables. The same data were exported to SPSS 17 for assessing correlations. The case addresses were plotted into a Geographical information system (GIS).

The study protocol was endorsed and approved by the Fiji National Health Research Committee and the institutional review committee of the College of Medicine, Nursing and Health Sciences, Fiji National University.

**RESULTS**

The average monthly maximum temperature in Fiji is highest in the first and the last three months of the year (Fig.1). The highest average annual maximum temperature was recorded at 32°C in January 2003 and 2005 in the first quarter of the year.

*Fig.1. The average annual maximum temperature by month in Fiji, 2003-2010*
The lowest average maximum temperature from 2003 to 2010 generally occurred during the months from July to August. The lowest average annual maximum temperature at mid-year was 26.8°C in 2003 and 2006.

The average monthly rainfalls were highest from January to March for 2006-2009 (Fig.2). However in contrast, the average rainfall was lowest in May 2005 and September 2003. In general, the lowest rainfall occurred during the months of April to July, with the lowest recorded average rainfall in September, 2003 at 14.7mm. The longest dry spell (ave. rainfall <100mm) occurred during 2003 (May-Nov.) and 2010 (April-Sept.)

Fig. 2. Average monthly rainfall (mm) for Fiji, 2003-2010.

The highest recorded rainfall occurred in January of 2009 with 823 mm. The average monthly relative humidity for Fiji was generally highest in the first six months of the year (Fig.3). The relative humidity varied by year within the range of 67-85%. The highest average relative humidity occurred in Mar, 2007 at 85% and lowest in October, 2009 and 2003 at 67%.

Fig. 3. Average monthly relative humidity in Fiji, 2003-2010

Dengue Fever Incidence

Dengue fever case numbers generally varied between the two major ethnic groups during the years 2003 to 2010 (Table 1). However, i-Taukei’s had the largest proportion and number when accumulated for the years from 2003 to 2010. The highest number of dengue fever cases was reported in 2009, with the preceding year revealing the gradual increase in the number of dengue fever cases.

Table 1. Serological confirmed Dengue Fever cases by Ethnic group, Gender in Fiji, 2003-2007

<table>
<thead>
<tr>
<th>Ethnicity</th>
<th>Gender</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fijian i-taukei (%)</td>
<td>Female</td>
<td>62</td>
</tr>
<tr>
<td>Fijian Indian Origin (%)</td>
<td>Male</td>
<td>14</td>
</tr>
<tr>
<td>Others (%)</td>
<td></td>
<td>62</td>
</tr>
</tbody>
</table>

Table: Dengue Fever Incidence by Ethnic group and Gender in Fiji, 2003-2010

There was very little difference in total dengue fever cases by gender; however males have a slightly higher count of cases for most years from 2003 to 2010. The serological confirmed cases were generally stable from 2003 and 2007 (Fig.4).

However, in 2008 there was a sudden rise in the number of dengue fever cases especially amongst the Fijian i-Taukei.

Fig. 4. Laboratory confirmed Dengue Fever cases by months in Fiji, 2003-2010.

This was observed beginning in the first three months and then an almost two-fold increase in cases in the months of August-September that extending into the following year. An even larger number of dengue fever cases were identified in the first three months of 2009 before it declined to stable levels by August.
Correlation of climate variability to dengue fever cases
A moderate correlation \( (r=0.446) \) is observed between monthly average rainfalls versus dengue fever cases \( (p<0.10) \) (Table 2). Similarly, a moderate correlation \( (r=0.397) \) is observed for average monthly maximum temperature against dengue fever cases \( (P<0.05) \). However, a weak correlation is observed \( (r=0.176) \) with average monthly temperature.

Table 2. Correlations of climate variability and dengue fever cases in Fiji, 2007-2009

<table>
<thead>
<tr>
<th>Variable</th>
<th>Correlation (r)</th>
<th>Sig (2 tailed)</th>
<th>Type of correlation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rainfall/precipitation</td>
<td>0.446</td>
<td>0.06</td>
<td>Moderate</td>
</tr>
<tr>
<td>Temp.(Av. max)</td>
<td>0.397</td>
<td>0.016</td>
<td>Moderate</td>
</tr>
<tr>
<td>Ave. relative humidity</td>
<td>0.176</td>
<td>0.303</td>
<td>Weak</td>
</tr>
</tbody>
</table>

Geographic Information System (GIS) mapping
The geographical locations of the dengue cases were described in a GIS mapping system, to identify the high-risk communities by province (Fig.6). Macuata and Naitasiri recorded the highest number of dengue cases from 2003 to 2010 with 235 and 114 respectively. The province of Namosi recorded the least number of dengue cases and no dengue case was reported from Kadavu province.
Tropical cyclones were most frequent in El Nino years and less frequent in La Nina years (Australian Bureau of Meteorology and CSIRO, 2011). This period of TCs and drought (2007-2009) also corresponds to periods of extreme climatic variability (high temperature, high rainfall and humidity).

The extreme climatic variability during the first three and last three months of the year (2008-2009), as an effect of El Nino, corresponds to the surge in the number of dengue fever cases that eventuated in an outbreak in the last quarter of 2008 that extended to early 2009. The significant moderate correlation between temperatures and precipitation against the number of dengue cases supports the association of dengue fever incidence to extreme climatic variability that occurred from 2007 to 2009. Some studies show that rainfall, temperature, and relative humidity influence the risk of DF outbreaks (Depradine & Lovell, 2004). Although the data did not provide strong correlation between climate variables and dengue incidence, other environmental and biological factors at play to influence dengue incidence such as the abundance of the aedes vector, potential breeding sites for the aedes mosquito, susceptible population, etc. as it is directly influenced by high ambient temperature and rainfall. High temperatures increase biting or feeding frequency; expedites development process from larval to adult stage; hastens incubation of dengue virus in mosquitoes that results in a higher dengue transmission rate and large mosquitoes populations in a shorter period of time (Focks et al, 2009). The periods of drought associated with the El Nino effect during late 2008 and early 2009 also influence the behavior of humans to increase water storage in open containers, potentially serving as a breeding source. Secondly, the eggs of the Aedes aegypti are quite hardy in dry conditions and quickly hatch to adults upon the onset of heavy rain, which also flushes eggs, larvae, and pupae to other breeding sites. The decline in cases following 2009 is associated with the end of the El Nino effect and possibly related to the intense and immediate prevention and rehabilitation efforts undertaken by a ‘whole of government’ approach to the impact of an initial spate of tropical cyclones. The public and environmental health interventions undertaken to prevent and control dengue outbreaks in 2008 & 2009 included source reduction of potential dengue breeding sites, residual spraying of affected areas, community awareness and use of mass media social mobilization of public to action. Another tropical cyclone occurred in early 2010 (TC Tomas) during a period of drought but cases of dengue fever remained at low levels.

The difference in IgG and IgM positive cases is related to patient exposure to the dengue virus. Dengue fever is endemic in Fiji and an initial predominance of dengue virus IgG suggests previous exposure or is secondary to a serotype of dengue fever. A positive Dengue virus IgM indicates recent or acute infection of Dengue fever. In dengue endemic countries, acute clinical cases with a positive IgM are classified as probable dengue (WHO, 2012). The sudden increase in dengue virus IgM in August-September 2008 is a strong indicator of a dengue fever epidemic in evolution with the rise in acute infections for dengue fever.

The geographical locations of the dengue cases in a GIS mapping system, to identify the high-risk communities by province are a first attempt in Fiji. There is potential to further extrapolate the case locations to village and household level with the use of a more detailed government mapping system. However, this was not possible in this study as addresses of cases are not identified on the standard laboratory forms. Furthermore the GIS maps can be used to explore the influence of the physio-environmental factors on dengue fever incidence as in time series studies that include population density, forest cover, land use and socioeconomic status. Remotely sensed data can be used to identify, monitor and evaluate environmental factors between vectors and environmental relationships. It can also be used to provide information on the spatial distribution of the vector-borne diseases and the physical environment (Beck et al., 1994). A study in Sri Lanka used GIS to identify high dengue risk zones in a dengue risk map that is used by its public health department for applying preventative measures to control dengue outbreaks (Nakhapakorn & Tripathi, 2005).

Although the effects of climate variability on the transmission dynamics of dengue fever were not explored in this study, the information it provides is a basic step towards with understanding dengue fever dynamics in Fiji. And may help in the development of early warning systems based on climatic factors. Climate variability under extreme conditions, serological immunological results and correlation studies could be useful in developing early warning
systems for dengue fever outbreaks in Fiji.

The climate data which is averaged from data obtained from the various meteorological stations around the country is limited in its generalizability to the different weather patterns in the division and dengue incidence in different parts of the country. Further limitations of this study were the minimal data on laboratory confirmed dengue data available from 2003 to 2006. The minimal data reflects a sub-epidemic period with low laboratory requests by clinicians. Another limitation is the absence of data corresponding to the four viral serotypes DENV-1, DENV-2, DENV-3, and DENV-4, which may have differential influences on population immunity.

However, findings from this research should pave the way for more detailed studies, which should account for the distribution of the Aedes mosquito utilizing other analytic methods to describe relationship between climate variability on dengue fever incidence. Possible methods include time series Poisson regression model that establish association between dengue incidence and weather predictors while taking into account the delayed effects of exposure and further discuss how these predictors are associated with increasing intensity and magnitude of dengue cases. Multiple regressions analysis applied would provide further evidence about the relationship between several independent or predictor variables such as rainfall, temperature, humidity and dengue fever (a dependent or criterion variable).

CONCLUSION

The study show that the intensity and magnitude of dengue cases increased significantly following extreme weather events experienced from 2007 to 2009. In the absence of a specific laboratory test for dengue fever, the combination of serological dengue results, climate variability data and historical events can help identify an early surge of dengue fever cases and contribute to an early warning system for disease outbreaks. In addition, the early warning system can help identify conditions precede an outbreak, using these parameters, and thereby reduce the early impact of dengue epidemics on humans, the health care system and the economy.

RECOMMENDATIONS

- Further study to determine the vulnerability of the Fiji population to dengue fever and other emerging infectious diseases, especially in this era of climate change.
- Climatic variability data, etc. as an early warning system for dengue outbreaks.
- Allocation of ample resources (financial & equipment) to local authorities located within areas at risk of dengue transmission to aid in prevention and control efforts.
- Inclusion of the residential addresses of cases in laboratory and investigative forms to allow timely, precise and effective administration of public health intervention programs and immediate response to dengue fever in the community.

REFERENCES

Intergovernmental Panel on Climate Change (IPCC), Pacific – an update of the current Situation. Public Health Surveillance and Response, 12(2).
Keiranu JE & Fay RW. (1968). Effect of food and temperature on aedes aegypti (L) and aedes triseriatus larval development. Mosquito news, 28(338-341).
Mueller BA, Durell DK, Bruce AW, & Shannon NB. (2009). Using Weather to predict dengue fever in Puerto Rico. Department of Tropical Medicine, University of Hawaii, USA.
Keywords: Lymphatic Filariasis, Fiji

INTRODUCTION

Lymphatic Filariasis (LF) was once a major cause of morbidity in the Pacific and also in Fiji (Mataika, Dando, Spears, & Macnamara, 1971). Fiji joined the Pacific Program to Eliminate Lymphatic Filariasis in 1999 with the aim of eliminating lymphatic filariasis as a public health problem by conducting mass drug administration (MDA) to reduce the lymphatic filariasis prevalence rate to a level that transmission is disrupted or unsustainable in the population (WHO, 2011b). A baseline assessment survey conducted in 2000-2001 on a sample of 5,983 revealed a prevalence of Wucheria bancrofti antigen by Immunochromatographic testing (ICT) of 16.6% nationwide. The WHO Pacific Elimination of Lymphatic filariasis (PacELF) recommended the implementation of at least 5 annual rounds of MDA with anti-filariasis medications, namely diethylcarbamazine citrate (DEC) and albendazole to achieve the goal of elimination (WHO, 2006). The first round of annual MDA began in 2002 to 2006 with a mean annual coverage rate at sub-threshold levels of 66.62%. This was much lower than the recommended MDA coverage of 80% estimated to reduce the prevalence and density of microfilaria in the population (Michael & al., 2004). Consequently, the lymphatic filariasis prevalence rate of 9.5% from a national survey in 2007 is attributed to the low national MDA coverage from 2002 - 2006. (MOH, 2008). An additional two rounds of annual MDA was therefore conducted in all divisions in 2008 - 2009. While the Central/ Eastern Divisions conducted another round of MDA in 2010, the Western Division and the Northern underwent further evaluation activities. The Western passed in the first Transmission Assessment Survey in 2011, thus the programme ceased the MDA. As for the Northern, the prevalence in the 2011 survey was above 1% of threshold, the Division joined Central/ Eastern Divisions in conducting another 2 rounds of MDA in 2011 and 2012. The purpose of TAS was to assess the impact of MDA in lowering the burden of disease to a level that transmission is unsustainable (WHO, 2011a). The objectives of TAS are to a) provide a simple, robust survey to determine the prevalence of filariasis among 6-7 year olds; b) provide the evidence base for program managers that MDA can be stopped and c) to assure national governments that national programs have achieved the elimination goals (WHO, 2011c). The first TAS in the country used new global program guidelines to verify the <1% prevalence rate in 2007. The Western division successfully implemented their MDA activity which is reflected in a single ICT positive for antifilarial antigens identified out of 3,245 year one and two students.

The Northern Division had the next lowest prevalence rate at 2.9% in the 2007 survey and similarly planned a prevalence survey after two rounds of MDA in 2008-2009. A follow up survey in 2011 revealed an ICT antigen prevalence of 1.1%, slightly above the threshold of 1% and with most ICT positive cases identified from Taveuni Subdivision. Subsequently, an additional two annual rounds of MDA was implemented in 2011 and 2012 for the Northern Division including Taveuni. The MDA coverage rate for 2008 for the mainland of the Northern Division was above 85% while Taveuni recorded poorly on the MDA.

In contrast to the other divisions, the Central and Eastern divisions conducted additional rounds of MDA until 2012, based on a historical high prevalence of ICT antigenemia in the 2007 survey, estimated at 15.4% for the Central and 11.1% for the Eastern Division (MOH, 2008). However, the sampling methodology for the Central and Eastern division surveys differed from that used for the Western and the Northern divisions.
The Central and Eastern Division samples were not randomly selected but from known sentinel sites with increased incidence of disease that over-estimated prevalence rates for these divisions. Most subdivisions in the Central division achieved MDA coverage above 80% from 2008 to 2012, with the exception of Suva (MOH, 2012).

The purpose of this paper is to outline survey results from three different methods of assessment conducted in the Northern and Central divisions in 2013 (Rinamalo & Tuibeqa, 2013). Furthermore, discuss the implications and additional strategies to achieve the elimination of lymphatic filariasis in the respective divisions.

METHODOLOGY

The final phase of assessment for elimination of lymphatic filariasis in Fiji is the Transmission Assessment Surveys (TAS). TAS is considered when survey areas complete at least five effective annual rounds of MDA. An effective MDA is defined as having coverage rates of above 65% of the total population or 80% of the eligible population (children 2 years above and excluding pregnant women) (WHO, 2011a). Furthermore, the sentinel site (SS) survey or spot-check (SC) sites would require a prevalence rate<2% before TAS could be conducted (WHO, 2011a). The spot checks and sentinel sites differ mainly by location. Spot checks are considered when the sentinel sites are not available or inaccessible during the period of assessment.

A spot check was conducted on Taveuni island after the 2013 prevalence survey in the Northern Division, mainly because the largest numbers of positive ICT antigen cases was detected in Taveuni in the 2011 prevalence survey. A convenience sample of at least 500 people (at least 300 tested) was selected from Wairiki and other surrounding communities (Lavena, Bouma, Naselelele, Velagi, Vunikawa, Somosomo, Wailalov, Vuna and Ura localities). The subjects were selected from areas of known cases from previous surveys in communities not affected by migration and that had similar demographic characteristics to the rest of the population. All members of the selected communities were included in the spot checks with the exception of children under 2 years of age and pregnant women, as they were not eligible for the treatment.

The TAS in the mainland Northern Division (Cakaudrove, Bua and Macuata Subdivisions) target 6-7 year-olds in year one and two in randomly selected primary schools. The Survey Sample Builder requires a sample size of 3198 students in 83 out of 140 primary schools for an estimated prevalence>2%, (LF Support Centre/Taskforce for Global Health). A critical cut-off criterion is determined prior to ICT testing for antigenemia in children. A child that is ICT positive with the number of circulating filarial antigen (CFA) above eleven infers additional annual MDA in the area. An ICT card is a useful and sensitive tool for the detection of *W. bancrofti* antigens in the body. A child’s finger is pricked with a lancet and about 100 micro-litres of blood is collected into a capillary tube. The blood in the capillary tube is then released directly onto a ICT card and read after 10 minutes, according to manufacturer instructions. The cards were kept in a secure, cool place for quality control purposes and disposed into an incinerated at the end of the survey.

The Central division was last properly surveyed in 2007, as the last survey in 2010 only selected samples from the Rewa, Naitasiri and Serua/Namosi subdivisions and excluded Suva and Tailevu subdivisons. A sample of 355,966 were registered for the prevalence survey in the central division. The registered individuals were above 2 years of age and lived in the division. A cluster survey method was used with assumptions for a prevalence of 0.5%, confidence interval width of +/- 0.5%, confidence coefficient 95% with a design effect of 2.5. The method included a 30 cluster survey with an estimate of 5 eligible subjects per households. The minimal sample size for the Central Division based on these assumptions was 1,950 divided into 30 clusters of 13 household. The estimated number of persons per household was 5 which meant each cluster had about 65 individuals (i.e.30 x 13 x 5).

Clusters were identified from a list of nursing zones provided by sub divisional health sisters from the Subdivisions, using proportional probability sampling (PPS). Random numbers for a sampling interval was obtained using RANDBETWEEN function in Microsoft Excel. Adding the sampling interval to the chosen random number generates a series of numbers that select the total 30 nursing zones in the Central Division. Each selected nursing zone had a list of localities (villages or settlements) that enabled the random selection of the first locality for the survey.
Similarly, in each locality, a geographic map with households enabled the random selection of the starting household. All eligible subjects in the household were registered and tested for the presence of circulating filarial antigen with an ICT card. A positive ICT test requires immediate treatment of the subject with DEC and albendazole. Subsequent households were selected from the first household along the road, by skipping every third household in the urban area and a household in the rural area, until 13 households were completed for the cluster.

All the results from the three assessment categories were tabulated and analysed using Excel Windows 7 and STATA (StataCorp, 2011).

The study protocol was endorsed and approved by the Fiji National Health Research Committee and the institutional review committee of the College of Medicine, Nursing and Health Sciences, Fiji National University.

RESULTS

A total of 1,036 people were tested for filariasis antigenemia using ICT cards in 2 sites identified in Taveuni for spot-check surveys (table 1). A total of 21 cases were ICT positive, 4 from the Wairiki site and 17 from other suburbs site, yielding 0.83% and 3.05% of prevalence respectively. Most positive ICT cases were males above the age of 20. Wairiki is a small, busy urban centre on the island and the number of participants tested was more than the estimated population. The twenty positive cases were treated onsite while a pregnant case would receive treatment after giving birth.

Table 1. Summary of Spot-check survey results on Taveuni Island, 2013.

<table>
<thead>
<tr>
<th>Site</th>
<th>Tested</th>
<th>Positive</th>
<th>Population of the area</th>
<th>Prevalence in village</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wairiki</td>
<td>480</td>
<td>4</td>
<td>400</td>
<td>0.83</td>
</tr>
<tr>
<td>Other suburbs</td>
<td>556</td>
<td>17</td>
<td>2,543</td>
<td>3.05</td>
</tr>
<tr>
<td>Total</td>
<td>1,036</td>
<td>21</td>
<td>2,943</td>
<td>2.02</td>
</tr>
</tbody>
</table>

The survey team visited all the 83 selected schools in the TAS for the Northern Division. The initial sample size was 3,198 with 3,080 year one and two students enrolled in the schools. In total, only 2,643 students were tested, about 86% of the target population.

There were three ICT positive students that had CFA less than 11 (Table 2). Three students were from Cakaudrove (one female and one male, from the same school) and the other male student from Bua. These students were all year one students and about 6 years old. All the positive cases were treated with a course of DEC and albendazole.

Table 2. Summary of Transmission Assessment Survey results in the Northern Division, 2013

<table>
<thead>
<tr>
<th>Items</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of schools surveyed</td>
<td>83</td>
</tr>
<tr>
<td>Total student enrolled</td>
<td>3,080</td>
</tr>
<tr>
<td>Total number of students tested</td>
<td>2,643(86%)</td>
</tr>
<tr>
<td>Total number of students absent*</td>
<td>437(14%)</td>
</tr>
<tr>
<td>Total number of positive cases</td>
<td>3</td>
</tr>
<tr>
<td>Total number of negative cases</td>
<td>2,640</td>
</tr>
<tr>
<td>Cut-off value</td>
<td>11</td>
</tr>
</tbody>
</table>

*Absent represents students who were not available during the test or did not provide parental consent.

In the Central division, a total of 2,157 participants were enrolled out of 392 households from 30 clusters and 2,051 tested with ICT cards. An average household size was 5.5 persons. Two ICT positive cases were identified hence a prevalence of lymphatic filariasis antigenemia of 0.1% (Table 3). The cases were male farmers living in Nasoqo settlement, with one that recently moved from Nasau in the Lau group of islands in the Eastern division. The cases were treated on site.

Table 3. Summary of the Prevalence survey results in the Central division, 2013

<table>
<thead>
<tr>
<th>Item</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total number of people enrolled</td>
<td>2,157</td>
</tr>
<tr>
<td>Total number of people tested</td>
<td>2,051</td>
</tr>
<tr>
<td>Total number of household surveyed</td>
<td>392</td>
</tr>
<tr>
<td>Total number of positive cases</td>
<td>2</td>
</tr>
<tr>
<td>Total number of negative cases</td>
<td>2,049</td>
</tr>
<tr>
<td>Prevalence rate</td>
<td>0.1%</td>
</tr>
</tbody>
</table>
DISCUSSION

Spot check surveys in Taveuni Island initially planned to cover a population of at least 500 people per site was successfully conducted in two sites (WHO, 2011b). All age groups above the age of two and pregnant women residing in the sites were included. However, the guideline recommends samples for assessment that include children over the age of 5 years and pregnant women (WHO, 2011a). However, in order to minimize confusion in the field, the assessment was carried out targeting two years old and older, the minimum age for treatment with antifilarial drugs. The Taveuni spot checks revealed remaining burden of disease on the island as the prevalence rate remains above threshold levels especially in communities around Wairiki. A large number of the positive cases identified in the Spot check surveys were from Lavena and Bouma villages, where most positive cases were identified from the 2007 survey (MOH, 2008). Some cases did not participate in previous rounds of MDA and therefore were not treated. It is also possible that the initial prevalence of infection and initial intensity of transmission was at such a high level that two rounds of MDA was not sufficient to disrupt transmission of lymphatic filariasis on the island (Burkot & Ichimori, 2002). Hence the recommendations, to undertake spot checks in Taveuni for another two annual rounds of MDA, with emphasis on direct observed treatment (DOT).

The TAS in the Northern Division excluding Taveuni had three positive cases but with a CFA less than 11 which suggests that transmission of lymphatic filariasis in the population has not been sustained. Based on the global guideline, MDA in the Northern division can be stopped, however post-MDA surveillance activities by two or more consecutive TAS in the next 5 years is required to detect any recrudescence (WHO, 2011a).

Based on the results, the Central division has likely achieved a lymphatic prevalence below the 1% elimination. However, the sentinel sites would need to be surveyed to validate the low prevalence in the division. These sentinel sites are historically high burden localities in the eastern coastal regions i.e. Rewa Subdivision. If after the sentinel site surveys, the prevalence for the division remains less than 1%, then post-MDA surveillance with TAS would continue.

There were several challenges encountered by the lymphatic filariasis survey teams during the conduct of surveys and follow up in the Northern and Central divisions. In the North, unfavourable weather conditions contributed to absenteeism in schools during the survey team visits. The low compliance with consent forms i.e. unreturned forms made up the total number of students absent. Though the level of absenteeism observed was considered in the estimation of the sample size, it will be helpful to consider these factors in planning future surveys. The other major challenge in the conduct of the survey in the Central division was the unavailability of selected household members during the day. Most survey clusters for the division were in the urban city of Suva and therefore most household members were either at work or at school. As a result, the survey team extended their work hours until late in the evening to enable follow up visits to unavailable subjects during the day. Similar to the Northern division survey, survey teams in the central division would need to reconsider survey hours to reduce the low participation rates and improve efficiency.

CONCLUSION

In conclusion, based on the survey results post-MDA surveillance activities is recommended for the mainland of the Northern Division with two rounds of annual MDA required for Taveuni subdivision. Although the Central division survey showed a prevalence rate<1%, further testing at the sentinel sites in the coastal margins of Viti Levu would determine if the division conducts a TAS or another two rounds of annual MDA.

REFERENCES

Active Ocular Trachoma In Fiji- A Population Based Prevalence Survey

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ABSTRACT

Trachoma, an infectious ocular disease, is responsible for 3% of the world’s blindness. From the results of WHO-supported Trachoma rapid assessments previously conducted in countries within the South Pacific sub-region including Fiji 1, the Fiji Ministry of Health acknowledges that Trachoma is prevalent in-country, although the morbidity and associated-blinding burden of the disease is yet to be estimated. Given the current deficiency of reliable information on Trachoma in country, the Fiji Ministry of Health recommended the conduct of a cross sectional community-based survey to estimate the prevalence of the disease in Fiji and also a preliminary assessment of the risk-factors associated with disease transmission. From the 4 identified study districts, 80 communities were selected by multistage random sampling, for the survey. A total of 4000 children 1-9 years old were randomly selected from 2401 households within these communities and assessed for trachomatous inflammation follicles (TF). A total of 1974 individuals were randomly selected from approximately 1000 community households within the Western and Northern study districts and assessed for Trachomatous Trichiasis (TT). Of the 4000 children clinically examined for TF, 15.4% were diagnosed with the disease and of the 1974 individuals assessed for TT, 7.4% were clinically identified with the condition. The basic risk factor assessment indicated that personal hygiene initiatives of keeping the face clean does not have a protective effect on TF. Trachoma is therefore hyper-endemic in Fiji warranting the implementation of the WHO-recommended SAFE strategy in-country. Further assessments on TT and a more comprehensive risk assessment for Trachoma are also recommended.

INTRODUCTION

Trachoma, a chronic keratoconjunctivities and neglected tropical disease, is the world’s leading cause of infectious blindness. The disease is largely endemic in 56 developing countries around the world causing substantial economic loss and associated social constraints in those countries. Trachoma occurrence is associated with poverty, occurring most frequently where overcrowding is common and access to water and sanitation constrained. Ocular serovars of Chlamydia, namely A, B, Ba and C cause repeated ocular reinfections leading to dense scarring of the upper eyelid over the years. The clinical course of Trachoma in terms of severity comprises Trachomatous Inflammation Follicle (TF), Trachomatous Inflammation Intense (TI), Trachomatous Conjunctival Scarring (TS), Trachomatous Trichiasis, Corneal Opacity (CO), and Blindness.

Trachoma in Fiji threatens the progress of key development issues relevant to the Millenium Development Goals (MDG). Once thought to be endemic globally, changes in lifestyle and improvement in basic necessities of water and sanitation in developed countries have witnessed the decrease of trachoma in those countries while developing countries have continued to battle with active trachoma in children, and its blinding consequences in adults.

While information, from the Rapid Assessment of Avoidable Blindness (RAAB) conducted in Fiji in 2009 on causes of blindness in those over 40 years of age, does not feature complications from trachoma in its top three causes 2, issues arising from trachoma – pathophysiology, mode of spread, high risk groups, management – directly or indirectly impact on the prevailing Millenium Development Goals, particularly Children’s Health; and are items of priority, recognized globally and regionally by renowned organizations including the United Nations International Children’s Emergency Fund (UNICEF), WHO, and Secretariat of the Pacific Community (SPC). Furthermore, to achieve the Fiji MoH Vision of “A healthy population in Fiji driven by a caring health care delivery system” 3, trachoma needs to be addressed sooner, targeting children and health care givers, rather than later.

Keywords: Ocular Trachoma, Fiji.
WHO and Trachoma

WHO in its effort to control and eliminate trachoma, endorsed the SAFE Strategy for the management of trachoma. SAFE is an acronym meaning Surgery for the eye lid complication of trichiasis, Antibiotic for the active phase treatment and can either be oral or topical, Facial cleanliness to improve hygiene and less spread by flies and Environmental improvements to ensure adequate water and sanitation. WHO also launched the Global Elimination of Trachoma by the year 2020 (GET2020) commencing 1999. Through good advocacy by this group, Pharmaceutical Giant – Pfizer – stepped in to provide free azithromycin to qualified countries through the International Trachoma Initiative (ITI). Currently, all countries showing a prevalence rate of active trachoma of more than 10% after PBPS qualify to lodge applications for azithromycin MDA through ITI.

To assist countries map the presence of trachoma, WHO developed the Trachoma Rapid Assessment (TRA) protocol to see whether trachoma was present in an area. TRA is a method of obtaining information about a set of problems in relation to trachoma, in a short period and without large expenditure of professional time and funds. It represents the first step in the process of identifying the communities that should be prioritized for planning and implementing trachoma interventions. It does not provide an accurate population based assessment so is useful to identify and prioritize communities where trachoma is a problem. To provide more reliable data for trachoma, PBPS is advocated and for trachoma, where clustering within regions and households is common, the Cluster Random Sampling method is acceptable.

Trachoma in Fiji

In 2005, Fiji was noted in a WHO report as one of 5 countries in the Pacific that still had active trachoma. In 2007, TRAs conducted in Fiji and 4 other pacific island countries by the University of Melbourne and partners showed trachoma to be of possible endemic proportions in all countries. In Fiji TRAs conducted in 2007 showed prevalence of active trachoma in the Western Division to be 22% in 1-9yr children while rates for scarring in the >40yr age group was 18.8%. Further TRAs conducted in the primary schools in the northern and central divisions showed prevalence rates of 11%.

Rationale for Trachoma PBPS

To date, evidence on the prevalence of active trachoma in the region is based on Trachoma Rapid Assessments (TRAs). While these surveys provide good data to indicate whether or not active trachoma may be present at endemic levels, they are not designed to act as baseline data, which is needed in order to treat and eliminate the disease. If we are to eliminate trachoma by the year 2020, more evidence – in the form of population based data – is needed to inform the next steps of eliminating trachoma in the Pacific.

From the above TRA results, anecdotal evidence suggests the presence of trachoma as a high endemic possibility in Fiji. Given the TRA findings and the opportunity to obtain MDA through the International Trachoma Initiative (ITI), the Ministry of Health’s Trachoma taskforce approved the conduct of the national Trachoma PBPS. This document reports on the PBPS conducted in Fiji, a collaborative effort of the Fiji MoH, IAPB, and local NGOs.

AIM

The aim of the survey was to map trachoma in Fiji by providing more accurate prevalence data of active and blinding trachoma in Fiji.

OBJECTIVES

The objectives of the survey were:
To estimate the prevalence of active trachoma (TF) in children aged 1-9 years in Fiji
To estimate the prevalence of blinding trachoma (TT) in persons ≥ 15yrs in 2 divisions in Fiji
To undertake a preliminary assessment of risk factors for trachoma transmission amongst affected individuals, their household and community
To make recommendations on the way forward given the results of the survey

METHODOLOGY

The survey involved quantitative and qualitative methods. The quantitative component comprised a cross sectional clinical survey for acute trachoma (TF and TT) in 1-9 year olds and Trachoma Trichiasis (TT) at the survey sites, and the qualitative aspect of the study involved an observational descriptive assessment of primary personal and environmental risk exposure for Trachoma amongst affected children.
The survey was undertaken in the Central Eastern health division, the Northern health Division, the Western health division and the Suva Sub-division. Each divisional health area consists of subordinate sub-divisional health areas that supervise several health center areas, which in turn presides over nursing zones. The nursing zones service several communities which comprise either indigenous Fijian villages or settlements of mixed ethnicity. 1–9 year old children living at the survey sites were eligible for the survey.

The EPI INFO program for population survey determined sample size with a confidence level of 95%, an expected prevalence for trachoma of 10%, an error margin of 5% and a design effect of 4 was used to adjust cluster effect and the sample size was calculated to be 4000 children from 2001 households around the country. A multistage cluster random sampling was used to define the study communities. For each of the 4 study districts, approximately 1000 respondents were selected from 560 households in 20 communities within the 100 or so health zones of the 77 health center areas and 16 subdivisional health areas. A total of 4000 respondents 1–9 years old were enrolled for the study. For the TT study, the same estimation method of sample selection was conducted in the Western and northern divisions with a total sample size of 1974 evaluated.

For each of the 20 selected study-communities in the division, the first household for study was selected at random and subsequent households were chosen according to their proximity to the previously assessed household until 50 children 1–9 years old were assessed for clinical signs of T rachoma. 2 teams of 5 persons visited the selected study sites and used the WHO simplified clinical grading system for T rachoma to diagnose the disease in the sample population. Using the WHO simplified clinical grading system for trachoma, members of the survey teams were trained by a specialist on TI and TT which was subsequently reinforced training via a pilot. Also, training on T rachoma environmental risk exposure was also undertaken to the all members of the two survey teams.

Ethical clearance for the study was obtained from the national health research committee and the Fiji national research and ethics committee. Those respondents manifesting signs of active trachoma were treated with tetracycline eye ointment whilst those with TT were referred to the ophthalmology department at the divisional hospital for tertiary ophthalmology care. The IAPB ophthalmologist investigator supervised the survey districts regularly and monitored the quality of data.

Respondent's demographic information was collected and those with clinical signs of trachoma were interviewed. The survey officers undertook an onsite descriptive observation of selected exposure risks for trachoma which includes face washing habits of children, presence of a latrine, garbage disposal, and accessibility to water. Data was analyzed using SPSS version 20. Simple descriptive analysis was employed to demonstrate the prevalence of Trachoma in the communities and the associated effect of sociodemographic characteristics of respondents, personal hygienic practice, and environmental health on the disease.

Results and Discussions

Quantitative Active TF Prevalence Estimation

Summary Demographic Distribution

The following Tables 1 and 2 gives a breakdown of demographic data and shows little variation between age groups, though the iTaukei population remains the majority surveyed with 82.6% of the study sample (Table 1).

Table 1: Summary Demographic distribution

Looking at age distribution (Table 2), there was a mean age of 5.03yrs (standard deviation 2.514) with little variation between the age groups. When looking at gender, there was little variation as well, with males more commonly screened at 51%.
Table 2: Age & Gender Distribution of Children Screened

Figure 1 demonstrates a steady increase in TF amongst 1-9-year olds, peaking at 5yrs before a decline, however the rates of trachoma after 5yrs remains higher than in the pre-school age group.

Figure 1: TF across the age groups from 1-9yrs

Distribution by Locality and Ethnic Group

Table 3 distributes the prevalence of TF by division and ethnic group. For TF by division and ethnic group across Suva and the Northern division, it was noted that despite the large difference in total numbers of children per ethnic group screened, the overall rates for active trachoma in the 2 major ethnic groups were very similar. Prevalence of TF averaged at 15.4% but ranged from 10.4% and 10.6% in Suva and Centeast respectively to as high as 20.9% in the Northern division and 19.6% in the Western division.

Table 3: Active Prevalence Rates by Division and Ethnicity

Quantitative Blinding Trachoma Survey

Table 4 describes the demography of samples enrolled in the blinding trachoma survey. A total of 1,974 valid cases were screened and analyzed for blinding trachoma across the Northern and Western Divisions.

The slightly increased proportion of females as surveyed for this component of the study is consistent with the WHO recommendations on convenience gender sampling.
Distribution by Localities
There were a total of 146 cases identified with TT giving a prevalence rate of 7.4% (95% CI 6.32–8.64). This exceeds the 0.1% TT rate that WHO would recommend the full implementation of SAFE. Table 5 provides the divisional and sub divisional breakdown for population found to have TT.

When looking at all 3 grades of trachoma that lead to blindness – TS (trachomatous scarring); TT (trachomatous trichiasis) and CO (Corneal Opacities), Figure 3 shows us that all 3 grades are prevalent with higher rates in the Western Division. Rates for these blinding or potentially blinding trachoma include trachomatous scarring rates of 16.6% (95% CI 14.99 – 18.27); while rates for corneal opacity were 0.3% (95% CI 0.14 – 0.16).

Table 5: Trachoma Trichiasis per subdivision screened

<table>
<thead>
<tr>
<th>DIVISION</th>
<th>SUB DIVISION</th>
<th>TT (n, %)</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Northern</td>
<td>Taveuni</td>
<td>2 (4.3)</td>
<td>0.92 – 12.82</td>
</tr>
<tr>
<td></td>
<td>Cakaudrove</td>
<td>9 (1.8)</td>
<td>1.9 – 6.9</td>
</tr>
<tr>
<td></td>
<td>Bua</td>
<td>12 (20%)</td>
<td>11.83 – 31.78</td>
</tr>
<tr>
<td></td>
<td>Macuata</td>
<td>40 (6%)</td>
<td>4.47 – 8.12</td>
</tr>
<tr>
<td></td>
<td>TOTAL NORTHERN</td>
<td>63 (6.2%)</td>
<td>4.85 – 7.81</td>
</tr>
<tr>
<td>Western</td>
<td>Rakiraki</td>
<td>9 (9.1%)</td>
<td>4.86 – 16.38</td>
</tr>
<tr>
<td></td>
<td>Tavua</td>
<td>1 (2%)</td>
<td>0.35 – 10.30</td>
</tr>
<tr>
<td></td>
<td>Ba</td>
<td>19 (9.5%)</td>
<td>6.17 – 14.36</td>
</tr>
<tr>
<td></td>
<td>Lautoka</td>
<td>13 (6.5%)</td>
<td>3.84 – 10.8</td>
</tr>
<tr>
<td></td>
<td>Nadi</td>
<td>14 (5.6%)</td>
<td>3.34 – 9.11</td>
</tr>
<tr>
<td></td>
<td>Sigatoka</td>
<td>27 (18%)</td>
<td>12.68 – 24.92</td>
</tr>
<tr>
<td></td>
<td>TOTAL WESTERN</td>
<td>83 (8.7%)</td>
<td>7.09 – 10.68</td>
</tr>
<tr>
<td></td>
<td>GRAND TOTAL</td>
<td>146 (7.4%)</td>
<td>6.32 – 8.64</td>
</tr>
</tbody>
</table>

Figure 3: Graph of blinding trachoma grades across the 2 divisions

Qualitative Observational Data

Facial Cleanliness
Figure 4 shows slightly higher number of males with dirty face, while interesting and unexpected results are seen in figure 5 with a higher percentage of children with trachoma having a clean face (68%) compared with those who had unclean face (32%).

Figure 4: Proportion of dirty faces across gender

Figure 5 demonstrates that TF was more prevalent amongst children with clean faces which would contradict the prevailing premise that trachoma largely affects children lacking facial cleanliness. There may be bias associated with this result given that the study respondents were aware of the study team making the onsite visit. It would be more relevant to enquire on the frequency of facial cleanliness daily.

Waste Disposal
The four surveyed districts almost reached the 100% target for each household to have improved latrine as seen Figure 6 with 99% in the North, 99.2% in Suva, 99.3% in the Central Eastern division and 99.7% in the West.
However, the use of the beach to defecate was still evident in the West (0.03%), in Suva (0.92%), and in the North (0.01%) study districts. One observation indicated the presence of communities in Suva who still used the bush and beach. These communities were identified as those that had just moved to the area and were still in the process of establishing themselves in the area.

**Figure 6: Bar Graph of Type of Latrine Used per Division**

![Bar Graph of Type of Latrine Used per Division](image)

**Accessibility to Water**

Figure 7 demonstrates that 100% of those from Suva and the Central Eastern study district were able to get water in less than 30 minutes of walking, about 95.4% from the West and the North with 89.5%.

8.3% of those that have to walk 30-<120min to get water were from the North and 4.6% were from the West. Only the North have 2.5% that have to walk >120min to get water. Most of these people are those living in the cane belts and those in the highlands of Vanualevu and Nadi who have tank water but have to draw their bullocks loaded with 44 gallon drums down to the water source to fetch water and take them up again to their homes.

In Fig 8, the relationship between accessibility to water source and dirty face is apparent; the graph demonstrates that the shorter the walk to the water source the less the dirty face examined compared to the longer the walk to the water source where more the dirty faces were observed. Conversely, there is still a comparable rate of dirty faces in those who take less than 30 minutes to walk to nearest water source and those that take 30 – 120 minutes.

**Proximity of Solid Waste Disposal**

With solid waste disposal, the public health policy recommends having a disposal system 6m away from residential dwellings given the propensity for such waste to attract flies which can serve as disease vectors, hypothetically ocular trachoma. Figure 9 demonstrates that the majority across the Suva and Cent/Eastern district survey sites indicate larger proportions having their waste disposal less than 6m from their household dwelling. This is understood given they are predominantly urban areas with individual households expected to have rubbish bins which are serviced by the local town or city councils either twice or three times weekly.

For outer and rural households, it is more desirable to have the waste disposal site further away which was observed during the survey.
CONCLUSION AND RECOMMENDATION

Conclusion
Fiji is considered endemic for active trachoma with prevalence rates of 15.4%. The TT findings conclude that potentially blinding trachoma is present in the Northern and Western Divisions. These results may be an over estimation, hence further research in this area is currently being planned by MoH for implementation later this year (2013).

Trachoma is prevalent in Fiji, and in endeavoring to eliminate this disease from our shores; the responsibility needs to be shared among key stakeholders within government and with external collaborative partners. The following recommendations highlight a way forward to fully implement the SAFE Strategy.

Recommendation
As the prevalence of Trachoma Follicles (n=4000) in this survey is 15.4% and each of the four surveyed areas are all above the 10% prevalence rate and are classified as endemic areas according to the WHO recommendation, it is strongly recommended that Fiji consider implementing the Mass Drug Administration of Azithromycin as an immediate approach to controlling the morbidity burden of the disease. Submission of forms for the next round of MDA needs to be promptly addressed;

The findings of this survey strongly recommend that F and E components of the SAFE strategy recommended by WHO should be strengthened and implemented alongside MDA as a long-term sustainable prevention solution;

Developing a National Trachoma Action Plan is of paramount importance as it will encompass all issues pertaining to trachoma and its elimination through the SAFE Strategy. The plan should be endorsed by the MoH prior to SAFE intervention;

For successful implementation of SAFE Strategy it is necessary to have an active Trachoma Taskforce in place and the MoH recruit a NTC to coordinate all efforts toward elimination of trachoma from Fiji; and Source other funding bodies to take the project forward from July 2013 onwards, in addition to seeking opportunities to collaborate with key partners for a more integrated approach towards elimination.

REFERENCES
3 Fiji Ministry of Health Annual Corporate Plan 2012. pg 8
4 Metcalfe J “Blindness, Poverty and the Millenium Development Goals” IAPB Briefing Paper 2012 August
9 Pacific Island Sub-regional Trachoma Meeting Report. IAPB/Vision 2020/Centre for Eye Research Australia
Reduction of the scrotum by scrotomectomy and plasty in the surgical treatment of large hydroceles in lymphatic filariasis endemic countries

Capuano G.P1*, Capuano C2

ABSTRACT

Objective: to classify our techniques of reduction of the scrotum by resection or “scrotomectomy”, with plasty for large hydroceles.

Patients/Method: We developed three main types of scrotomectomy-plasty: unilateral, bilateral and resection of the inferior pole, utilized in a series of 50 scrotomectomy-plasty in a homogeneous series of 148 hydrocelectomy in 117 patients.

Results: 92% of patients treated by scrotomectomy-plasty had a hydrocele at an advanced stage (54% stage III and 38% stage IV). In 24% of preoperative indications for scrotomectomy-plasty we observed during surgery a sufficient retraction of the scrotum to prevent it. Thus, out of 117 patients 43% had a scrotomectomy-plasty. We recorded 6 complications, all in hydroceles stages III or IV with scrotomectomy-plasty. Five of these patients had a hematocoele or chylocele. Two did not benefit from our compressive dressing. These complications only delayed by a few days the complete cure. In all cases the esthetic result was very satisfactory.

Conclusion: The esthetic and functional result of hydrocelectomy is significantly completed through resection-plasty of the scrotum without increasing the postoperative morbidity in the immediate and close follow up. The three main types of scrotomectomy-plasty that we developed and utilized allowed us to properly manage all stages from I to IV of our clinical classification. The technique should be extended to other homogeneous series for a more precise codification of the procedures as outlined and a review of patients on distant follow up.

INTRODUCTION

The scrotum may not or may insufficiently retract during and/or shortly after the surgical treatment of a large tropical hydrocele. This finding in the Pacific, an area endemic for lymphatic filariasis, is only confirmed in the literature by Dandapat et al.1. In 1973 Wilkinson2 described a process of eversion of the hydrocele sac without resection of the excess scrotum counting on its “probable” contraction within three months after surgery, making an excision unnecessary. As Dandapat et al.1 we observed very poor results in patients operated elsewhere by this technique, who consulted for an excessive postoperative scrotum causing -sometimes important- bodily disgrace and functional impairment.

In the extensive literature available on the surgery of hydroceles, the article published in 1984 by Dandapat et al.1 is the only one, to our knowledge, explaining the reasons and reporting a technique of reduction of the scrotum in the surgical treatment of large hydroceles. However, we note that none of the reviewed articles published thereafter mentioned this technique. So it seems that the scrotal resection, in its design and in its techniques, maybe insufficiently explained and illustrated, was not retained.

This work aims to codify the techniques of scrotal reduction that we developed during our long years of practice and practical usage. We recently documented the postoperative results of these techniques, in the immediate and short terms and in the medium term for some patients who were assessed after 13 months.

METHODS

Two campaigns of hydrocelectomy, in 2009 and 2010 in four subdivisional hospitals completed by a third campaign (2011), in a district hospital in Fiji allowed the observation, the clinical classification and the surgical treatment of 117 patients with 148 hydroceles. We include under the term hydrocele hematocoeles and chyloceles treated by the same technique. The hydrocelectomy, unilateral or bilateral, was completed in 50 cases by a reduction of the scrotum by “scrotomectomy” and closure by plasty of our personal design. The clinical classification we developed and used is presented elsewhere3. It allows knowing exactly what type of hydrocele we are referring to when it comes to its size.
We follow the World Health Organization guidelines and treat all of them by total vaginalectomy, whether simple or complicated by hematocele or chylocele. However, the standard technique leaves a “safety” collar of tunica vaginalis around the testicle. In our technique we go further, and systematically expand the standard vaginalectomy to a complete resection of the parietal layer of the vaginalis by electrocautery knife, as close as possible to the path of its continuation as the visceral layer.

To this step, which we consider as a curative one, we associate in large or very large hydroceles but not systematically, a resection of the scrotum or “scrotomectomy” of the residual excessive scrotum with a plasty. We developed and use three main types of scrotomectomy-plasty: unilateral or bilateral plasty depending if they relate to one only or the two lateral portions of the scrotum and the resection of the lower polar cap (of the whole scrotum). The surgical technique of these resection-plasty is described in a separate detailed and illustrated article for surgeons.

RESULTS
The results presented here include only the 50 scrotomectomy-plasty we conducted between 2009 and 2011 in a homogeneous series of 148 hydrocelectomy, all realized in continuity and by the same team.

Age distribution of patients: The average age of these 50 patients was 46 years. The youngest was 24 years and the oldest 70. The majority of patients (81%) were between 31 and 60 years, with a peak of prevalence (35%) between 41 and 50 years.

Type of scrotal resection-plasty used and hydroceles clinical characteristics: Among the 50 patients in this series, 50% had a left side hydrocele. 12 hydroceles (24%) were bilateral. Figure 1 shows the distribution of plasty by clinical stage of the enlargement of the scrotum according to our classification. 92% of patients who benefited from a scrotomectomy-plasty had a hydrocele at an advanced stage, respectively 54% at stage III and 38% stage IV. We made a resection-plasty, in addition to the hydrocelectomy, in one case of stage I and four cases of stage II of our classification.

Distribution of type of plasty by technique used: The distribution of scrotal reduction performed by type of plasty is shown in Figure 2. In 40% of cases we performed a Resection of the Lower Polar Cap (RCPI), and in 54% an Antero-Latero-Posterior Plasty (PALP). In 6% of cases we used a Bilateral Anterior-Lateral Plasty (BAL) or another type of plasty.

Aspects of the liquid and hydrocele bag: The fluid contained in the vaginalis is not always fluid and citrine. In this series of 50 hydrocelectomy with scrotomectomy-plasty, we note 3 chyloceles and 13 hematoceles (27%), with a thick and chocolate-colored liquid and without or with more or less abundant debris. The bag wall is usually thickened and inflammatory. In 4 cases it contained calcifications forming a difficult-to-dissect fibrous shell, requiring the emptying of the bag before opening and externalization of the intra scrotal mass. In these cases the resection of the vaginalis in one piece might be impossible even with the electrocautery knife, and might require its removal in several pieces.

Preoperative indication of plasty and retraction of scrotum during and after surgery: In our series of 117 patients we initially considered 66 cases (56%) for a resection-plasty of the scrotum. However, in 16 cases (24%) of preoperative indications, the retraction of the scrotum during surgery was sufficient to prevent the predicted resection-plasty of the scrotum.
Therefore 43% only of the patients – and not 56% as originally planned – finally benefited from a scrotomectomy-plasty. So, while we do not deny the existence of per and/or postoperative scrotal retractions we also observe that the retraction of the scrotum is insufficient or inexistent in a high number of cases. Furthermore, among the 50 patients who had a scrotomectomy, no retraction of the scrotum during or immediately after surgery occurred. In any event, should a retraction occur, it would never be sufficient to adequately reduce the remaining excessive scrotum of a stage III or IV hydrocele. In fact, a postoperative retraction of the scrotum simply further improves the quality of the aesthetic result of the reduction of the scrotum by resection-plasty.

**Results of the technical procedure:** 111 out of the 117 patients who benefited from a hydrocelectomy (95%) had an uneventful postoperative course. Among the 50 patients who had a scrotomectomy-plasty in addition to the vaginalectomy, 44 (88%) had remarkably simple postoperative course both locally and generally. They were discharged from hospital 4 to 6 days after surgery with the exception of a few patients who lived in remote and isolated places. As a reminder, these procedures were performed by a mobile team bringing its equipment in the different hospitals where a limited number of beds were allocated. There was therefore a need to shorten the stay for a quick turnover of patients. Results were excellent in all cases, both from the aesthetic and from the functional point of view. All patients reviewed after 13 months reported a positive psychological impact due to the full recovery of all their activities (walking, professional, sexual, sports, miction).

**Complications:** We observed six immediate complications. These 6 patients are aged 30 to 70 years. Five of them had a unilateral hydrocele with four on the right side. Only one had a bilateral hydrocele. Among these six complications we observed a hydrocele with no testis and one post-operative trauma after hospital discharge. These six cases had the following factors in common: - “large” or “very large” hydroceles: stage III or IV of our classification; - hydroceles associated with a buried penis of grade 1 (1 case), grade 2 **2** grade 3 **2** or grade 4 **1** of our classification; - hydroceles complicated with chylocele or hematocel with or without cruoric debris;
- patients who had a resection-plasty of the scrotum: 4 PALP and 2 RCPI;
- strictly local complications, without hyperthermia: hematoma, infections, infected hematoma.

The overall complication rate in our series was 5% (117 patients): 12% for hydroceles associated with a plasty of the scrotum (50 patients), whereas it was 0% for hydroceles treated by total resection of the vaginalis and simple closure of the scrotum (67 patients). We also noted that among the 50 scrotomectomy-plasty, all but two patients benefited from our compressive suspensory dressing presented elsewhere (personal communication). These two patients were also among the 6 who had a complication. These six complications were treated by debridement and/or drainage and excision with drainage or wicking. In all cases the postoperative course was uneventful and the rapid and complete healing with a satisfactory esthetic result observed.

**DISCUSSION**

The complete surgical treatment of large hydroceles with emptying and total removal of the vaginalis is required for all hydroceles in LF endemic countries, whatever their stage. “Standard” hydrocelectomy can effectively improve the anatomical aspect and the comfort of the patient. However the appearance and volume of the scrotum will often remain far from normal. The scrotum, stretched for years by a hydrocele which may contain a large amount of liquid (up to 3.6 liters in the series presented) does not always regain its elasticity. The muscle fibers of the dartos will equally not regain sufficient elasticity and contractility (often already weakened by age) to raise the intra-scrotal contents to its normal anatomical site: under the root of the penis.

Apart from the publication by Dandapat et al. **1** we did not find in the literature any description of surgical techniques for the reduction of the excessive scrotum or any reference to scrotal reduction interventions in the treatment of hydroceles. It seems that this problem has not received enough attention.

The techniques of extended scrotal resection proposed in the literature for peno-scrotal elephantiasis [5-11], are not suitable for hydrocele and, from our point of view, contra-indicated. They are not suitable because they are not justified in the treatment of hydrocele. These nearly complete resections of the scrotum are mutilating and the results of a surgery which is too heavy for a “simple” hydrocele.
The surgical act would be disproportionate. Some of them require skin grafts, hardly feasible in outpatient or semi-ambulatory surgery, with regular and prolonged monitoring and dressings required in strictly aseptic environment. This is not feasible in the implementation of concept of “hydrocele mass campaigns” (12, personal communication).

In contrast, the scrotum of a hydrocele, although often thickened, has kept sufficient flexibility and thinness to allow the realization of overlaying plasty, which are unrealistic or difficult to achieve in peno-scrotal lymphedema.

We present here a series of 50 unilateral or bilateral plasty. Even if we consider this number as insufficient to describe a clear classification of the indications, the encouraging results confirm our previous findings, and seem to allow consideration of the procedures presented. When the conditions allow it, the “scrotomectomy-plasty” significantly improves subjective and objective results. Subject to contra-indications and usual precautions, and given the results we think that indications can be expanded even at the cost of an increased risk of postoperative complications of 0% to 12% in our series. While these complications delay the final healing by a few days, they respond usually quickly to a simple treatment and do not affect the final result.

A scrotum distended by a hydrocele where the lower pole goes down to mid-thigh, or even lower, will not retract enough after hydrocelectomy to go back to its usual site, on the ventral side of the penis, with a lower edge of the glans at the same level as the lower pole of the scrotum. This consistent finding during our long practice, including twelve years in the Pacific, led us to conceptualize a preventive solution to the postoperative setbacks and disappointments of the surgical treatment of the urogenital complications of lymphatic filariasis in its most advanced forms. While postoperative complications (edema and hematoma) are reported with regularity, these setbacks on the esthetic result never appear in published series of hydrocelectomy, series which are often much larger than the one presented here.

The remaining surface of the scrotum is often large or very large after a simple closure of a large hydrocele, leaving in place a large “ear” of scrotum which may fall to mid-thigh. We therefore consider that in these cases, the surgical treatment did not fully reach its goal, in a surgery where the objective is also to reduce the excessive mass. To overcome this drawback, a “scrotomectomy-plasty” appears as the best solution.

The principle is to remove the maximum reasonable surface of distended scrotum and of dartoic bag insufficiently retracted.

This is the only way to avoid leaving an unsightly residual pocket after removal of the hydrocele. This raises the problem of skin closure, especially after resection of the lower polar cap, removing the lower pole of the scrotum, also avoiding a suture on the lower pole of the future neo-scrotal purse(s) in anatomical position. Hydroceles shapes are as variable as their sizes. A hydrocele may develop transversely and not vertically. A right hydrocele may develop transversely to the left, pushing ahead the median raphe and the left testicle up or down, and vice versa. In these exceptional cases the classification that we proposed 3 should consider a vertical extension of the transverse dimension of the hydrocele.

Because of a big size right hydrocele, the lower pole of the right purse may have gone much lower down than the left side. It makes sense to bring it back up with an appropriate resection-plasty of the scrotum, even if it should be extended to the side not affected by a hydrocele 3.

For uni- or bilateral hydroceles stages III and IV, a resection-plasty of the scrotum is necessary due to the considerable excess of the non-retracted scrotal envelope now emptied of its pathological content.

These preliminary observations led us to propose different types of flaps so as to cope with all possible situations. However, we always considered the following:

1) The possibility of a peroperative retraction of the scrotum especially, at least in principle, in the youth. This is why we never did the resection immediately. We first proceeded with the incision of the hydrocele, at the top or bottom limit of the future flap according to the type of resection-plasty considered. The contra-incision will be done, if necessary, after hydrocelectomy.

Due to the longer duration of the intervention, we may observe a sufficient retraction of the scrotum preventing the anticipated resection-plasty (drawn on the scrotum). Thus, out of the 117 patients, the anticipated scrotomectomy-plasty for 16 of them was canceled due to the sufficient spontaneous retraction of the scrotum. The age of these patients varied widely (41-61 years) as well as the stage of their hydroceles (stage II to IV, bilateral in two of them). Thus, the retraction of the scrotum during surgery is real and sufficient in about 24% of cases to avoid a scrotomectomy.
We observed no retraction of the scrotum immediately after or in the following days of the surgery.

In contrast, it seems interesting to report the observation of a 16 year old patient whose scheduled resection-plasty was canceled because of an excellent per-operative retraction. However he presented quickly after surgery an enlargement of the scrotum possibly by loosening. The indication of a second intervention for scrotal resection-plasty was therefore proposed and accepted.

2) The need for the neo-purse to accommodate the testicle and its often long -or very long- and thickened cord: One need to keep in mind that the testicle cannot be compressed into a purse made too small because of a too generous resection. Thus, the case of this 67 year old patient, with a bilateral hydrocele, stage III on the right side and IV on the left, amenable to a resection of the lower polar cap. However, after drainage, the cord appeared thickened by inflammation as well as by distension, with an excessive length. This pleaded against the scrotectomy which would have led to the bending of the cord for its reinstatement and a compression of the intra-scrotal contents in the neo-purses.

3) The possibility of keloid scars. This could be inconvenient or painful in some patients. While the resection-plasty leaves a longer scar, the proposed designs prevent any strangulation.

4) Incision line: as with any plastic surgery, preliminary drawing of the incision is needed. The incision line should be as winding as possible, without any acute angle.

5) Path for surgical approach: These resection-plasty are only possible if the hydrocele is tackled from a horizontal path.

6) The advantages of the horizontal incision: The front median vertical incision used by many operators, does not appear to us as suitable for the radical cure of hydrocele with total vaginectomy in LF endemic countries. We keep it for the idiopathic hydroceles, of much smaller size, especially in children with a flexible scrotum, a thin vaginalis, and easily externalized through a short incision. These small and idiopathic hydroceles are excluded from this work.

The horizontal incision is preferred for the following reasons:

Filarial hydroceles are much larger (up to 2400 ml for a unilateral hydrocele in this series of 50 resection-plasty). The scrotum is an adult one, thickened, often inflammatory, sometimes with dermal lesions or scars (retractile after burns in one of our patients). Therefore it does not lend itself to a sufficient spreading for in-depth dissection.

All the liquid can be accumulated at the lower pole of the hydrocele with the cord and testicle retracted to the upper pole. The initial approach of the cord in its highest part for its isolation as we consistently practice it is more difficult for large hydroceles through the usual incision.

As we reported above, the liquid is not always fluid and citrine. The surgeon can face a chylocele, or a hematocèle with a thick chocolate liquid, combined with sometimes abundant cutaneous debris or hematous “mud”. In these cases a complete resection of the vaginalis (which cannot be maintained by simple flipping) is impossible or dangerous, and the cleaning, even prolonged, incomplete.

The bag wall is usually thickened and inflammatory. It may contain calcifications which can form a fibrous shell, difficult to dissect and first requiring the opening and drainage of the bag. Some authors have noted the presence of adult worms at the histological examination of the vaginalis [13-16]. We observed twice the presence of dead adults worms, maybe calcified considering their hard consistency. It appears to us illogical to leave in place a pathological tissue, moreover, often abundant (and heavy).

The vertical incision is inappropriate for scrotal reductions. From our point of view resection-plasty of the scrotum can only be performed by transversal resections in hydroceles stage III or IV.

A resection of the scrotum using an “orange quarter” shape, from one pole to the other after vertical incision can only lead to a decrease in volume in the width dimension of the purse. After hydrocelectomy, in case of absence or poor retraction of the scrotum, the residual scrotal enlargement is always downwards, whatever the form of hydrocele. Therefore one need to reduce but also to bring up the purses with a horizontal resection of the scrotum, even with a circular incision if needed (resection of the lower polar cap) and not with a vertical resection which can only lead to a reduction of the transversal diameter or the purse(s). A fortiori a resection of the lower polar cap of the purses can only be done through a circular horizontal incision.

For stage I or II hydrocele, in which we can expect that a resection-plasty will not be needed, we use the transversal horizontal incision which can be enlarged secondarily in the anterolateral dimension, if needed. In stage III or IV hydrocele, where the need for a resection-plasty can be anticipated, the anterior incision must immediately be curved, convex or con
concave to allow enlargement according to the plasty envisioned. The type of plasty must indeed be pre-decided, even if it had to be adapted during surgery.

**Drawbacks and limitations of resection-plasty of the scrotum.**

The resection-plasty of the scrotum increases the duration of the surgical procedure appreciably, especially in its expanded version covering both sides. The duration of the intervention is a limitation for mass campaigns of hydroceles (12, 17). A trained surgeon cannot expect to complete more than three hydrocelectomy by complete vaginectomy with complementary resection-plasty of the scrotum in a day.

The resection-plasty of the scrotum is not a simple operation. At the edge of the specialty, it requires a good knowledge and a good training in plastic surgery. This, especially considering that we are treating an often pathological and more retractile tegument than the skin.

The scrotectomy-plasty is not a standard technique, applicable to all hydroceles and the multiplicity of processes described may appear superfluous or a disadvantage. However, like their size, the shape of the hydroceles is extremely variable. Therefore it seems difficult, if not impossible, to make a classification based on their form, which would help to codify the different techniques of scrotectomy-plasty. This explains the large number and diversity of the proposed methods. Some techniques will be commonly used while others will be barely or unused. However, their knowledge may be useful to the surgeon to deal with all situations and scenarios, choosing a particular resection-plasty as a framework, allowing a reconstruction of the purse(s) as close as possible to normal anatomy.

The resection-plasty of the scrotum can be hemorrhagic. The bleeding cannot be prevented by the ligation of a cut vessel or vascular pedicle. Even though the bleeding is only venous and peripheral, it may be abundant. It is easy but long to control because spread over large areas of inflamed tissues. This bleeding cannot be anticipated. In our series of 50 resection-plasty, one patient required a postoperative blood transfusion; others were compelled to iron therapy.

Per-operative complications: bleeding apart (which, however, is far from constant) we cannot report any other complication. Experience, precision and attention are the guarantees of safety during a total (and not subtotal, leaving a collar of pathological tissue around the testicle) vaginectomy as we perform it.

It should be noted that due to the plasticity and the possible partial and irregular contraction of the scrotum during surgery, minor alterations are sometimes necessary. They are usually needed at the end of skin suture, particularly at the tips of the suture line to correct the “ears” and for the sake of perfection in the reconstruction of a spherical purse as perfect as possible (two cases).

Post-operative complications. The 6 complications observed occurred among the 50 patients who benefited from a resection-plasty of the scrotum. This corresponds to a 0% rate of complication for hydrocelectomy by total vaginectomy without scrotectomy and a 12% rate of complications among the 50 patients who benefited from a scrotal resection-plasty in addition to the hydrocelectomy by total vaginectomy. However, it is difficult to attribute these complications to the scrotectomy-plasty alone, considering the well-known frequency of this type of complications of hydrocelectomy in general and especially by vaginectomy, even subtotal as generally reported (18) but without a complementary scrotomectomy-plasty. These 50 scrotomectomy-plasty, with the exception of two patients, benefited from the compressive-suspending dressing we proposed. We also observe that these two patients are part of the 6 patients with a complication.

We therefore believe it is prudent to complete any hydrocelectomy with or without resection-plasty, with the proposed compressive-suspending dressing, which we consistently apply to all hydrocectomies. We also note that these six complications all occurred in patients with hydrocele complicated by chylocele or hematocoele. In these circumstances, it seems difficult to attribute these complications exclusively to the resection-plasty of excessive scrotum.
CONCLUSION
The result of the “standard” hydrocelectomy in lymphatic filariasis endemic countries is often spectacular. However, in a number of cases, especially in hydroceles of stages III and IV of our classification, the result is not satisfactory both for esthetic reasons and because of the discomfort caused by the residual excessive scrotum. In our work an adequate per-operative retraction of the scrotum was observed in about one in four cases only. The preventive “scrotectomy-plasty” that we developed was therefore needed in almost half of the hydroceles we had to treat in this series. The three main types of reection-plasty we developed and used allowed us to deal with all clinical cases presented to us, be they stage I, II, III or IV of our clinical classification.

We cannot present here long-term results, although the first 27 scrotectomy-plasty were reviewed after 13 months with excellent results. However all cases are regularly monitored by local teams. We remain convinced, that our satisfactory results should be completed by additional series to confirm the validity of this approach and to attempt a more precise codification of the various techniques to select the most suitable type of scrotectomy-plasty. A companion publication, intended for surgeons, exposes more technically the different approaches we use.

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REFERENCES
INTRODUCTION
Tuberculosis (TB) is a public health problem in Fiji with a prevalence rate of 33 per 100,000 and incidence rate of 26 per 100,000. Though the National TB Programme (NTP) has continued with the intense efforts to control TB since its establishment in 1951, TB continues to be transmitted and prevalent in certain areas in Fiji. Clustering of TB cases continue among disadvantaged groups such as those with a low socioeconomic status, malnutrition, living in overcrowded houses and highly populated areas. In addition to the social determinants of TB, factors such as the increase in cases of diabetes mellitus (DM) and human immunodeficiency virus infection (HIV) in Fiji impede TB control efforts. Evidence shows that DM and HIV increase the risk of acquiring active TB. A combination of the social determinants and these comorbidities will further increase the burden of TB. Therefore, it is vital for the NTP to identify locations of high TB burden and high risk groups to introduce interventions in a targeted approach. This study identifies the TB hot spot areas that require interventions for the reduction of TB burden.

METHOD
This is a cross sectional study involving the review of TB registers from 2011-2012.
Study Setting
Fiji is divided into three divisions for administrative purposes: the Central and Eastern Division, the Western Division and the Northern Division. In the public health sector, the island has three main hospitals, 19 sub-divisional hospitals, 78 health centers (medical areas) and 101 nursing stations, together with two specialized hospitals. The Fiji NTP was established in 1951 and adopted the DOTS strategy in 1997. There are three DOTS Centres, each in the three administrative divisions of the country, where TB patients are registered and receive the intensive phase of treatment for 2–3 months. Upon registration, the residential address of patients is recorded in the TB register and medical areas where patients reside are notified.

RESULTS
A total of 431 TB patients were registered, 213 and 218 in 2011 and 2012 respectively. The average CNR for the medical areas was 33 while the range was from 5 to 151. From the various medical areas that TB patients originated from, Table 1 shows only those areas that are of high burden (CNR ≥ 30 per 100,000). In the Central/Eastern Division, 11 medical areas have been identified as high burden. In the Western Division, 6 areas have been identified while in the Northern division, 10 areas have a high burden of TB. Table 2 describes areas that are of medium burden (CNR between 10 to 30 per 100,000). In the Central/Eastern Division, 8 medical areas have been identified as medium burden. In the Western Division, 8 areas have been identified while in the Northern Division, 4 areas have a medium burden of TB. Table 3 describes areas that of low burden (CNR ≤ 10 per 100,000). There were no areas identified in the Central/Eastern Division as a low burden. In the Western Division, 2 areas have been identified while in the Northern Division, 1 area has a low burden of TB.

1 National Tuberculosis Programme, Ministry of Health
* Address of Correspondence: shaktigounder@gmail.com
**DISCUSSION**

This study identifies medical areas in Fiji that have high, medium and low burden of TB based on the most recent data from registered cases in 2011 and 2012. In particular, the identification of high burden areas is vital to inform the programme and health workers in planning and implementing activities that will control TB in Fiji. With the limited resources available, activities that increase case detection need to target areas of high burden to reduce TB transmissions and prevalence. A study conducted in Brazil shows that reducing the transmission of TB in hot spot areas reduced city-wide TB incidence. Preventing TB cases in high burden areas identified in Table 1 may prevent more secondary transmissions than through efforts made in low burden areas. The hot spots identified are often characterized by dense population, poverty, poor housing or ventilation, HIV infection or diabetes prevalence and other social determinants.

Depending on the resources available, the TB programme may focus their efforts in high and medium burden with priority given to high burden locations. Active case finding (ACF) together with advocacy, communication and social mobilization (ACSM), trainings of health workers, and supervisory visitations by the NTP are the main activities to be implemented in these high burden areas.

The Fiji NTP currently depends mainly on passive case finding (PCF) procedures for the detection of active TB cases. Using this approach, persons with presumptive TB report to health facilities to be screened by a clinician, and are subsequently diagnosed and enrolled on TB treatment (or referred if found not to have TB). This approach relies on the patient to present for care, therefore it is a patient initiated approach. In order for Fiji to move from a low TB burden country to elimination of the disease, there is a need to increase case detection and maintain a high treatment success rate. Increasing case detection through strategic active case finding practices in the high burden areas will enable the Fiji NTP to lower the burden of TB and improve TB control. In addition to active case finding, the practice of enhanced case finding (ECF) through community awareness in hot spot areas will play an important role in increasing case detection. Training of health workers to improve diagnosis of TB combined with supervisory visits to health facilities are also activities necessary to control TB.

In conclusion, this study will inform health programmes and health workers of areas of high TB burden that require attention. This is to guide medical officers, nurses and public health staff on the need to prioritize areas, reallocate resources and plan and implement activities in a targeted manner.

Table 1: High burden (CNR>30/100,000) TB hotspots in Fiji, 2011-2012

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<th>Medical Area</th>
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<td><strong>Central</strong></td>
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<td>Valelevu</td>
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<td>Raiwaqa</td>
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CNR = Case Notification Rate per 100,000
### Table 2: Medium burden (CNR>10 and <30/100,000) TB hotspots in Fiji, 2011-2012

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<th>Medical Area</th>
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<td>Levuka</td>
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<td>Kadavu</td>
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<td>Naduri</td>
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<tr>
<td>Korotasere</td>
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</tbody>
</table>

CNR= Case Notification Rate per 100,000

### Table 3: Low burden (CNR≤10/100,000) TB hotspots in Fiji, 2011-2012

<table>
<thead>
<tr>
<th>Medical Area</th>
<th>CNR per 100,000</th>
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<tr>
<td><strong>Western</strong></td>
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<tr>
<td>Lomawai</td>
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<tr>
<td>Natubua</td>
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<td><strong>Northern</strong></td>
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<td>Wainikoro</td>
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CNR= Case Notification Rate per 100,000

### REFERENCES

A Basic Understanding of the Disease: Lymphatic Filariasis

Introduction
Lymphatic filariasis is one of the oldest tropical parasitic diseases caused by nematodes (filarial worms) transmitted to humans by arthropod vectors. The mature nematodes invade and obstruct the lymphatic system in humans to cause lymphedema, elephantiasis and hydrocele. It is a major cause of acute and chronic morbidity of humans in tropical and sub-tropical areas of Asia, Africa, the Western Pacific and Americas, with over 1.2 billion people that living in endemic areas at risk of infection. Many who are infected with the parasite are asymptomatic but a significant minority suffer from severe deformity, stigma and disability associated with the disease (Gill & Beeching, 2004). The disease impacts individuals economically and psychosexually. The World Health Organization (WHO) has aimed to eliminate lymphatic filariasis by the year 2020 and has classified it as a Neglected Tropical Disease (NTD)(WHO, 2012). The purpose of this essay is to describe the epidemiology, geographic occurrence, life cycle, clinical sequelae and control measures for lymphatic filariasis.

Epidemiology of Lymphatic Filariasis
Lymphatic filariasis is endemic in 83 countries. In 2008, the World Health Organization (WHO) estimated that 120 million people were infected with lymphatic filarial parasites and over 20% of the world’s population in the tropics are at risk of acquiring the infection(WHO, 2009). About 90% of filariasis infections are caused by the nematode Wuchereria bancrofti and most of the remaining 10% by the nematode Brugia malayi (Berger & Marr, 2006).

Human are the only hosts for the Bancroftian filariasis. It is rarely fatal but is a debilitating and disabling disease. It is also a major cause of morbidity among low socioeconomic groups in urban, rural and isolated, neglected populations (Pandeya, Madhumathi, Karandeb, & Kaliraj). WHO recognises lymphatic filariasis as the second leading cause (after leprosy) of permanent and long-term disability in the world (Wynd, Melrose, Durrheim, Carron, & Gyapong, 2007).

The morbidity of human filariasis is due to the host reaction to microfilariae or to the development of adult worms in different areas of the body (Simonsen, 2009). There is no known racial predilection and either sex is equally susceptible to filarial infection (Gill & Beeching). All ages are susceptible, although the rate of microfilariae in the blood increases with age as exposure to the vector increases. Furthermore, the disease manifests in an infected individual only after years of repeated and intense exposure. Hence, travellers to an endemic area are unlikely to be infected (Simonsen, 2009).

Geographical occurrence
W. bancrofti, is the most widely distributed filarial parasite of humans in tropical regions of Asia, Africa, the Americas (include the Caribbean islands) and the Pacific. It is prevalent in regions with hot and humid climates, in sub-tropical regions. Most of the global burden is estimated to occur in India (48 million cases) and Sub-Sahara (51 million cases). A large proportion (76 million) do not display any overt clinical signs or symptoms but may have internal pathological damage to lymphatic and renal systems. However, 44 million cases have disease manifestations (Das & Shenoy, 2008). Early WHO estimates indicate that more than 20% of the world’s population are at risk of acquiring the infection(WHO, 2007).

In the last decade, the disease has disappeared from North America, Japan and Australia while in China and Korea the infection rates decreased as a result of control measures. China was the first country to eliminate lymphatic filariasis based on criteria set by the WHO, followed by South Korea in 2008. Several countries such as Egypt, Sri Lanka, Vanuatu, and Zanzibar are undergoing detailed evaluation and surveillance to assess whether transmission has stopped (WHO,2007). In total, about 48 countries have active control programmes and are working towards the elimination of the disease (WHO, 2007).

The parasite requires an arthropod vector, a mosquito, as an intermediate host for the development of the filarial larvae. The distribution of mosquitoes varies by regions and the most common species are Culex.
Anopheles, Aedes and Mansonia. The main vector for \textit{W. bancrofti} in towns is the \textit{Culex quinquefasciatus} which breeds in drains and polluted water, and bites at night (Gill & Beeching, 2004). However, in many rural areas of Africa and the Pacific, the \textit{Anopheles} spp. mosquito is a major vector as it readily breeds in small pools of water or in receptacles such as discarded tyres and cans (Bockarie, Kazura, & Alexander, 1996; Simonsen, 2009). Some breeding sites are natural receptacles that make mosquito control a challenge in low resource countries. \textit{Aedes} genera are also important vectors in the Pacific islands and the Asian region. Different mosquitoes genera also differ in their efficiency in transmission, for example, the \textit{Anopheles} spp. mosquitoes are less efficient vectors of \textit{W. bancrofti} than Culicine mosquitoes (Gill & Beeching, 2004; Simonsen, 2009).

The Life cycle of \textit{Wuchereria bancrofti}

The life cycle of the \textit{W. bancrofti} parasite consists of five developmental stages in a human host and mosquitoes. The threadlike worms live and develop in the lymphatics of the groin, scrotum or limbs of humans (Gill & Beeching, 2004). The microfilariae undergoes its first three stages of development in mosquitoes in 10 to 12 days (Berger & Marr, 2006; Simonsen, 2009). In the mosquitoes’ gut, the microfilaria loses its sheath before penetrating the gut wall and the wall of the proventriculus (cardiac portion of the mosquito’s midgut) before entering the thoracic muscles. In the thorax, the microfilariae develop into the third stage infective larvae. The third-stage infective larvae then migrate through the hemocoel to the mosquito’s proboscis to infect another human host during a blood meal.

After inoculation into a human host, the fourth-stage larvae migrates centrally in lymphatic vessels and develops into a sexually mature adult male or female worms over a period of nine months (Nutman & Kazura, 2006). The adult worms reproduce and release many sheathed microfilariae that appear in the pulmonary capillaries after one year (Gill & Beeching, 2004; Chiodini, Moody, & Manser, 2003). The adult worms may live and produce microfilariae for more than 20 years, but the average lifespan of the microfilariae is about one year (Simonsen, 2009).

Microfilariae move in and out of circulating peripheral blood according to their daily cycle that coincides with the vectors biting habits (Simonsen, Meyrowitsch, Makunde, & Magnussen, 1995). In most endemic areas, the sheathed microfilariae have nocturnal periodicity, where large numbers of microfilariae are present in the peripheral circulation between midnight and 6 am. Small numbers are present during the day as most disappear into the pulmonary capillaries (Gill & Beeching, 2004; Nutman & Kazura, 2006). In these areas, the parasites are transmitted by night-biting mosquitoes. In contrast, there are greater numbers of microfilariae found in daytime blood (diurnal sub-periodicity) in the South Pacific islands due to the habit of local mosquitoes (Gill & Beeching, 2004). The periodicity of microfilariae in the blood is due to a biological rhythm inherent in microfilariae, which is influenced by the circadian rhythm of the host (Simonsen, 2009). In both situations, the highest concentration of microfilariae is observed when the local vector is actively feeding.

Clinical sequelae of Lymphatic Filariasis

A major challenge is the large numbers of asymptomatic individuals in the community during the initial stages of active filarial infection. Also, when patients present with chronic lymphedema, there is often no active filarial infection (Das & Shenoy, 2008). The clinical spectrum can range from an initial phase of asymptomatic microfilaraemia to the later stages of acute, chronic, and occult clinical manifestations. The clinical effects of infection with \textit{W. bancrofti} depend on the person’s immunological response which determines whether they react acutely in the early stages of the disease or remain asymptomatic carriers of microfilariae for many years. The largest group that comprise of otherwise healthy young adults and children can have microfilaria in their peripheral blood without any overt clinical manifestations and become persistent reservoirs of infection until treated (Ottesen, Ismail & Horton, 1999). However, few asymptomatic individuals progress to clinical disease (Gill & Beeching, 2004).

The few that develop clinical manifestations of lymphatic filariasis either display early disease inflammation or lymphatic obstruction. The early disease manifestations are associated with repeated episodes of lymphangitis, fever, headache, backache and nausea and genital complaints of unilucitis, epididymitis or orchitis (Berger & Marr, 2006). The lymphangitis typically radiates digitally from enlarged tender lymph nodes and does not spread upwards from an infected lesion. Oedema of limbs maybe transient during the acute phase and associated with epididymo orchitis (Gill & Beeching, 2004). Chronic presentation of lymphatic obstruction may occur after years of recurrent acute episodes associated with secondary bacterial infection of damaged lymphatic vessels. At this stage, the hydrocele in males can extend to the whole of the lower limbs (Das & Shenoy, 2008).
The enlarged hydrocele limits mobility and sexual activity (Berger & Marr, 2006). Persistent lymphadenopathy, splenomegaly and elephantiasis may be more common in isolated Pacific island communities than in other regions (Das & Shenoy, 2008).

There are several methods available to detect circulating filarial antigens in infected human blood, that range from simple microscopy of a blood smear to PCR testing. The two common diagnostic tests to identify active filarial in endemic populations are Og4C3 enzyme linked immunosorbent assay (ELISA) and an immunochromatographic card test (ICT) (More & Copeman, 1990; Weil, Lammie, & Weiss, 1997). The ICT is more sensitive and stable under field conditions than the Og4C3 Elisa test (Pani, Hoti, Vanamail & Das, 2004). However, the cost of ICT limits its use in most developing nations to program evaluation surveys or sentinel surveillance activities essential for eradication assessments (Pandeya, et al., 2011).

**Control measures**

The mainstay of control against lymphatic filariasis has been chemotherapy and vector control, either alone or in combination. Vector control is effective because the transmission of the parasite is very inefficient, the reproductive cycle is absent in the vector and only continuous exposure to bites of many infected mosquitoes sustains infection in humans (Bockarie, Taylor, & Gyapong, 2009b). Other public health interventions that address inadequate sanitation, improper drainage systems, over-crowding, and the lack of affordable personal protection are also important (Das & Shenoy, 2008).

The basic aim of control is to reduce microfilariae in the community to levels that prevent transmission (Das & Shenoy, 2008; Ottesen, et al., 1999). Mass treatment of endemic populations with anti-filarial drugs is a major control measure, targeting asymptomatic individuals (Das & Shenoy, 2008). In theory, mass drug administration or treatment aims to reduce microfilariae (mf) loads below a critical threshold level to effectively disrupt the transmission cycle of the parasite. Studies have demonstrated that an annual single dose of antifilarial drugs administered to at least >90% of the population could disrupt the transmission of the disease (Bockarie, Taylor, & Gyapong, 2009a).

The mass drug administration (MDA) programme in endemic countries is based on WHO and the World Health Assembly resolution for the Global Elimination of Lymphatic Filariasis (GELF) by 2020. The two principal objectives of the GELF are to interrupt transmission of infection and prevent disability caused by the disease. The first strategy refers to treating an entire population with an annual single dose of anti-filarial drugs for a period of 4–6 years. A combined drug regimen of albendazole (400mg) plus Diethylcarbamazine (DEC; 6 mg/kg) is administered orally to every person above the age of 2 years. However, in Africa and other countries with onchocerciasis, a combination of albendazole (400 mg) plus ivermectin (200mg/kg) is administered because of adverse drug reactions associated with DEC (MJ Bockarie, et al., 2009b; Gyapong, Kumarswami, Biswas, & Ottesen, 2005). Another population treatment regimen is using DEC-fortified salt. An alternative treatment regimen for individual cases is the inhibition of Wolbachia bacteria (an endosymbiont of bancroftian filariasis) with a 4–8 week course of doxycycline (200mg/day) (Taylor, Bandi, & Hoerauf, 2005; Taylor et al., 2005).

Elimination of filariasis by mass drug administration generally takes some years to reduce the microfilariae load in blood of affected individuals. Furthermore, the strategy depends on identifying the entire community at risk of filarial infection and ensuring that a high proportion (>90%) of the community take their annual doses of the anti-filarial drugs at a specific time period (WHO, 2009). Despite these challenges, several successful MDA campaigns have eliminated the disease in China and Korea, the Maldives, and a few Pacific Islands are on the verge of elimination (WHO, 2008).

The second GELF strategy focuses on alleviating the suffering and reducing the impact of disabilities on chronically affected individuals. It involves assisting affected individuals with the care or treatment secondary bacterial and fungal infection in limbs or genitals associated with lymphedema and elephantiasis. The strategy also prevents new cases of filariasis by reducing reservoirs of infection.

**CONCLUSION**

Lymphatic filariasis is a common parasitic disease in the tropics associated with elephantiasis and chronic limb swelling.
The disease affects millions of people in most tropical regions, albeit a large proportion that remain asymptomatic and are persistent reservoirs of infection in the population. Although the disease is not fatal, it is generally associated with disfiguring disabilities in affected individuals. The control of filariasis in most endemic countries is based on a mass drug treatment strategy that is aligned to WHO and its partners’ GELF program. Recent GELF success in the declared elimination of filariasis in China and South Korea has encouraged other endemic countries to achieve a similar goal. Implementing the GELF strategy is expected to draw increased attention to the welfare of chronic sufferers with disabilities as well as reduce the prevalence of active infection.

REFERENCE
INTRODUCTION

One of the most neglected among neglected tropical diseases (NTDs) is the soil-transmitted helminthiasis (STH). According to the WHO Preventive Chemo-therapy Databank, STH is endemic in more than 10 countries in the Pacific that includes Fiji. Prevention and control of NTDs can significantly contribute to the accomplishment of the Millennium Development Goals (MDGs) (World Health Organization, 2005). The diseases associated with STH occur throughout the developing world, but are most commonly seen in the poorest communities. Interventions in these communities such as deworming of school-age children can help eradicate poverty by boosting a child’s prospect to earn their way out of poverty (Miguel E, 2001). More importantly, the interventions reduce children’s susceptibility to infectious diseases and improve mothers outcomes during pregnancy, thereby contributing directly to improving MDGs (Savioli L et al, 2003; Stoltzfus RJ et al, 2004). The purpose of this paper is to describe the issues around strengthening STH prevention and control in Fiji in the past, at present and in a future project.

STHs are among the most common of all chronic human infections, occurring predominantly in areas of poverty and inadequate hygiene and sanitation in the developing world (Brooker & Bundy, 2008). The most common STH is from Ascaris lumbricoides (roundworm), Trichuris trichiura (whipworm), Necator americanus and Ancylostoma duodenal (hookworm). These worms commonly referred to as nematodes have similar biology and epidemiology that cause multiple infections. Infection by common STH is by the ingestion of eggs from contaminated soil or by larvae penetrating the skin. A STH infection in humans usually does not manifest in clinical disease or clinical signs and symptoms that is easily differentiated from other tropical diseases.

Occurrence of clinical disease is strongly related to the number of worms present and indicates intensity of infection. A large worm burden infection in humans can present as anaemia, poor growth and cognitive dysfunction in children. School age children, preschool aged children are at a high risk of morbidity associated with STH because of a large unrecognized worm burden. Chronic STH is associated with anaemia, vitamin A deficiency, stunted growth, poor intellectual development, and impaired cognitive function. Early recognition of STH is difficult with the identification of eggs in the stool or worms in overt clinical disease. However, simple anthelmintic treatment is effective in reversing any morbidity without a laboratory diagnosis. Hence, preventive chemotherapy with anti-helminthic drug should begin early in life, and every opportunity taken to reach at-risk populations such as pregnant women.

The development and survival of STHs is dependent on temperature and humidity, and so have a greater prevalence in the equatorial regions of the world (Brooker, Clements, & Bundy, 2006). The common STH’s development is arrested below 5°C and above 38°C. Furthermore the prevalence of T. trichiura and A. lumbricoides does not usually exceed 10% in areas where land surface temperature exceeds 38-40°C (Brooker & Bundy, 2008). Epidemiologic studies also demonstrate that prevalence is associated with rainfall and other climatic conditions. The high prevalence in developing countries in tropical regions is also associated with sanitation, hygienic behavior and socioeconomic status (Kightlinger, Seed, & Kightlinger, 1998). In endemic countries, the maximum prevalence occurs before 5 years of age and if left untreated remains high and stable throughout adulthood (Bundy, 1998). The mean intensity is highest in children aged 4-10 years hence its impact on growth and cognitive function.

Household clustering of heavy infection of STHs and small-scale spatial variations, is related to local
variation in socioeconomic status and environmental factors (Forrester, 1988; Raso, Vounatsou, Gosoniou L, & al., 2006). Therefore a principle of control of STH is through a combination of personal hygiene, proper disposal of faeces, health education and chemotherapy.

Interventions to prevent and control STH infections
The mainstay for the prevention and control of STH and its infections in the population in the Pacific is mass administration with anti-helminthic. The other important prevention strategies are interventions such as improving sanitation, health education, community participation, monitoring and evaluation which are critical to long term prevention of STH (Brooker S & Bundy DAP, 2008). The primary goal of anti-helminthic treatment is to reduce transmission, and worm burden associated morbidity. Age specificity of infection by the various STH is important to determine the most cost effective and acceptable approach. There is sufficient evidence to indicate that a cost-effective approach is a school-based de-worming program that controls the intensity of intestinal helminth infection even in environments where transmission is high (Warren KS, Bundy DAP, Anderson RM, & et al, 1993). The WHO global STH guideline recommends school deworming every 6-12 months (Figure 1). School-based deworming programmes can reduce rates of anaemia and improve healthy growth of children (Stoltzfus, Albonico, Tielsch, & et al, 1997).

A major challenge with regular anti-helminthic drug coverage is the extension of public health interventions to reach all individuals at risk of the morbidity caused by helminthic infection, while robust, low-cost and effective public health interventions are available to relieve the burden and provide a better quality of life for people in poor settings.

The World Health Assembly’s resolution 54.19 in 2001 committed to regularly treating 75% of school-age children at risk of illness from STH and schistosomiasis by 2010. In the Pacific, the target of 75% was achieved by a few countries and is achievable for the filariasis-endemic countries implementing annual rounds of mass drug administration (MDA) against filariasis through the Pacific Program to Eliminate Lymphatic Filariasis (PacELF) strategy.

The filariasis MDA regimen includes albendazole (ALB) 400mg and diethylcarbamazine citrate (DEC); the former is an effective anti-helminthic against STH. However, STH intervention strategies through the filariasis MDA need evaluation to ensure that the target for STH is met, as most countries are close to achieving the goal of filariasis elimination and scaling down on their filariasis activities. In addition, reaching out to all individuals at risk of the morbidity caused by helminth infection, including school-age children is still a challenge and requires special consideration for sustainable service delivery.

Another major challenge is the less known epidemiological profile of STH compared to lymphatic filariasis and a general lack of information to effectively guide an STH control strategy. A few studies in the region reveal that a substantial disease burden of NTDs in the Pacific is attributed to STH. The only multi-country survey in the region was conducted in 2001 prior to the commencement of the annual rounds of MDA for lymphatic filariasis (Hughes, Sharp, Hughes, & et al, 2002). It is likely that the epidemiological profile of STH in adults has been altered in most filariasis endemic countries after the minimum 5 rounds of the MDA. It is also possible that the prevalence rate for STH remains high, as new birth cohorts are exposed to environments of high transmission and conducive to the worm survival despite the interventions. Overall not much is known about the actual distribution of the disease and risk groups of the diseases following the filariasis MDA in the region.

In addition to mass administration of anti-helminthics or school ‘deworming’ program, improving sanitation in high-risk communities can improve the long-term control of STH. However, for many low-income countries and for poor communities in middle-income countries the strategies are expensive and occur over a longer-term, therefore the effect of sanitation is slow to develop. Furthermore, the stages to interrupting transmission through the improvements of water and sanitation require collaboration with other sectors such as education, environment and development agencies. In terms of strengthening the control of STH periodic anthelmintic treatments needs to be maintained at recommended levels with health education until sanitation is improved and has an impact on transmission.
**STH and deworming in Fiji**

A few studies have been published on the prevalence and control of STH in Fiji. A study in 1998 before PacELF, tested 123 villagers in the coastal area of Viti Levu (Tailevu), as well as 130 primary school children in an interior mountain region (Naitasiri) (Mathai, Goneyali, & Volavola, 1998). Among the 123 villagers, 11% were positive for *Ascaris*, 2% were positive for *Trichuris*, and 50% for hookworm.

Out of the 130 primary school children tested, 5% were infected with *Ascaris*, and 19% with hookworm. The authors concluded that intestinal helminth infections were high in Fiji, particularly in the coastal regions of the mainland. They further attributed their findings to significant faecal contamination of open land, resulting in a higher prevalence of hookworm among farmers and those in regular contact with the soil. A recommendation by the study is to increase public awareness and public health measures necessary to reduce the prevalence of STH infection in Fiji.

In the multi-country survey conducted in 13 PICs before the beginnings of lymphatic filariasis MDAs, 10.3% of 58 children at the urban test site were infected with helminths, compared to 9% of the 176 children at the rural test site (Hughes et al., 2004). The result from this study was not compatible with the findings from the previous study and a major difference is the location of test sites in the greater Suva area. Another study in 2005 examined school children from five villages in Taveuni (Thomas, Woodfield, Moses, & Amos, 2005). A total of 258 children aged 5–15 years were surveyed and the overall prevalence of infection was: hookworm 14%, *Ascaris* 33%, and *Trichuris* 17%. This study suggested a regular program of anthelmintic treatment of school children would only provide modest health benefits, due to the relatively low overall prevalence of hookworm infection and related anaemia.

While most parts of the country continued the annual rounds of LF MDA with variable coverage since 2002, there has been no other study to monitor and evaluate the impact of filariasis MDA on the STH, apart from the studies in 2001. The Western division in Fiji was the first to cease MDA after 7 rounds of MDA that achieved filariasis prevalence of less than 1% in 2011. A similar prevalence survey in 2013 is currently undertaken in the Northern division to decide on the continuation of filariasis MDA. Each division will implement its own strategy of filariasis elimination schedule.

In 2009, the MOH launched the National Iron and Micronutrient Supplementation (NIMS) programme based on the high level of anaemia and vitamin A deficiency found in the previous National Nutrition Survey. The objective of the programme is to reduce the prevalence of anaemia in school children, children under 5 years old, lactating women, and women of childbearing age. Activities include a 6 monthly distribution of deworming tablets, together with iron supplementation. The coverage of deworming since 2009 has been variably low by divisions, but by age groups is highest in school children. The program is yet to achieve the global target of 75% of pre-school and school children in a deworming program.

**A Project proposal to strengthen the control of STH in Fiji**

In July, 2013 a team of parasitologists from Korea visited Fiji, expressing interest to collaborate with the Ministry of Health in a partnership to strengthen the control program for STH in Fiji. The scope of the collaboration includes establishing a reference laboratory at the Fiji Centre for Communicable Disease Control (FCCDC), building local parasitology capacity and confirming the epidemiology of STH in the country. Currently, a memorandum of understanding (MoU) between the Ministry of Health, Fiji and Seoul National University College of Medicine has been drafted for Cabinet approval. The project should begin as soon as approval is provided and MoU signed before the end of October. The objectives of the partnership are to:

- Support the nationwide control project of STH in Fiji;
- Organize and establish a reference laboratory for parasitology in Fiji to assist in monitoring and evaluation of the STH control project;
- Build local capacity in parasitology and maintain a reference laboratory;
- Collaborate in ‘STH’ prevalence and morbidity surveys;
- Provide anti-helminthics for persons infected with ‘STH’ as necessary; and
- Collaborate in organizing the regional initiative of STH control for the Pacific.

The ultimate goal of the partnership is to augment existing interventions for STH in Fiji as necessary and reduce the burden of STH infections on vulnerable hard to reach communities in the country.
Expanding the knowledge on the epidemiological profile of the STH, reviewing the current strategy, as well as setting up of the efficient monitoring and evaluation framework would ensure public health interventions targeting the diseases will be effective. The first step will be to set up a parasitology reference laboratory at the Fiji Centre for Communicable Diseases Control to ensure that the project goals are met. The centre could take the lead in collecting and sharing of information from surveys, and engaging in control programs through the lymphatic filariasis program and the National Iron and Micronutrient Supplementation (NIMS) program with strengthened capacity.

The impact of MDAs with DEC and albendazole since 2002 and the effect of NIMS programme from 2009 will be evaluated and the result will serve as a baseline for designing new strategies. Sentinel localities will be selected to represent each of the ecological areas for the stool and morbidity survey data to be followed over time. Overall the project will serve as the basis for a more extensive control programme supporting the development of more effective interventions as well as scaling up of existing ones (Figure 1).

Laboratory technicians based at the public health reference laboratories and at the CWM hospital will be trained in identification of helminth ova and protozoan cysts, and faecal examination techniques. Health workers involved in the relevant programmes will be provided with the opportunity to be trained on the strategy of communicable disease control in Korea. Eventually the project, based at the Fiji Centre for Communicable Diseases Control, will serve as the base for organizing a regional initiative to control STH in the Pacific and possibly be called the Pacific Program to Control Soil-Transmitted Helminthiasis.

CONCLUSION

STH is a major cause of morbidity amongst children and women of child bearing age that has major implications on MDGs and health outcomes of a developing nation like Fiji. A major population intervention undertaken to control STH in Fiji and the Pacific is the mass drug administration of anti-helminthics for lymphatic filariasis elimination. Mass deworming through a school-based program is a cost-effective public health intervention that can alleviate morbidity related to STH. Anti-helminthics are inexpensive, single-dose and highly effective drugs to treat common STHs. A collaborate parasitology project is proposed to further strengthen the control and prevention of STH in Fiji.

REFERENCES


INTRODUCTION

Leprosy (Hansen’s disease) is a chronic infectious disease caused by the organism *Mycobacterium leprae*. Leprosy affects the skin, nervous system, eyes and respiratory tract mucosa. It affects all ages and both sexes. It has a long incubation period of 3-5 years, although many people have lived among lepers for much longer periods of time than this without contracting the disease. The exact mechanism of transmission of leprosy is not known. Until recently, the most widely held belief was that the disease was transmitted by contact between infected and healthy persons. More recently the possibility of transmission by the respiratory route has gained ground; for example, the bacillus can be dispersed by individuals when they exhale (Meyers, 2004).

Leprosy is endemic in many areas of the globe. The earliest documented case of leprosy comes from a human specimen dated to 200BC (Diamond, 1997). Leprosy appears to have spread from the Middle East to the rest of Europe and Russia by about the 12th Century AD. It is uncertain when it first occurred in the Pacific. Leprosy is an important cause of disabilities globally. Sufferers of the disease display either mild or severe dermatological and neurological lesions. The lesions if untreated can cause extreme deformity and incapacitation including deformities in the minor joints. The physical deformities and disability in patients often results in stigmatization or worse ostracization from the communities they live in. The disability and related social stigma are often significant barriers to full participation in society and considerable socioeconomic burden to the patients and the community (Withington, 2009). Despite the severity of the disease and its complications, it is now considered curable after the development of Multi Drug Therapy (MDT).

Historical background.

In 1887, the Berlin Leprosy Congress recommended the isolation of patients. In the Pacific, the Makogai Hospital was opened for leprosy patients in Fiji and the South Pacific in 1911 (Vakawaletabua & Batio, 2008). During its 58 years of service, approximately 4,500 patients were admitted to the leprosy colony (Buckingham J, 2006). About 1,500 died from complications related to the disease on the island while about 2,500-3,000 were repatriated to the mainland. The Missionary Sisters of the Society of Mary (SMSM) solely administered care in Makogai. The sisters often use traditional treatments like chaulmoogra oil until the discovery of dapsones (diamino- diphenyl-sulphone). It was the drug treatment with Dapsone that eased the case load and it became no longer economical to continue to send patients to Makogai. Hence the decision to move patients to the mainland and eventually Pj Twomey Hospital in Tamavua, Suva in 1969. At Twomey hospital, leprosy patients had more contact with the outside world and the disease became fully integrated into the general health services (Vakawaletabua & Batio, 2008).

Initially, dapsone was the only drug treatment, until resistance to the mycobacterium was discovered in the 1970s. As a consequence, the multi-drug therapy (MDT) was introduced and trialled in Suva Fiji in 1983. The initial treatment regimen in 1983 was 2 years treatment for (Multi Bacillary) and 1 year (Paucibacillary) which changed in 1995 to 1 year and 6 months respectively. A single dose of Rifampicin is currently considered for all close contacts of new cases in the last 10 years. A single dose of rifampicin kills about 90% of *Mycobacterium leprae*.

Epidemiology of Leprosy

Leprosy has been eliminated in Fiji since 1991, with the occasional identification of cases from endemic areas. The declaration of elimination of leprosy as a public health problem in Fiji by WHO was achieved in 1993, with the prevalence rate at <1/10,000 population. However, since 2003, the annual prevalence has generally been above the previous baseline levels (Figure 1). In 2012, the prevalence rate for leprosy in Fiji was at 0.07/10,000 populations which is a 43% increase from the previous 2 years. The increase possibly is due to increased detection of cases with the establishment of skin clinics in the division. A real increase has to be determined from incidence specific rates from endemic areas.

Keywords: Leprosy, Fiji
Figure 1 Prevalence of Leprosy in Fiji, 2002 – 2013

Figure 2 shows the incidence of leprosy cases from 2002 - 2013. A small number of cases are continually detected annually in the community, a high proportion is multibacillary (MB) indicating presence of the "hidden cases".

Figure 2 Incidence of Leprosy cases in Fiji, 2002-2012.

The surge in cases from 2011 to 2012 was similar to the number of the active cases and new cases.

Endemic areas.
Based on the leprosy register held at PJ Twomey hospital, it is a disease more commonly detected among Fijian males. The endemic areas in Fiji include Rotuma, Lau, Yasawa, Kadavu, Novosa, Suva, Tavua, Savusavu and Bua. Screening programs are continuously conducted in these areas in addition to the other skin conditions that mimic the clinical features of leprosy.

Leprosy control program in Fiji
Since establishment of the program in Fiji, the treatment and rehabilitation of cases have been major facets of the program. Former patients of the leprasorium are often severely disadvantaged by their disabilities and often stigmatised despite being completely cured from the disease. However, based on patient stories the experience in Makogai was more enabling in Makogai i.e. leprosy was the ‘norm’ on the island, the social disability of stigma was removed and people were able to be self-sufficient, to build community and social relationships and to live a fairly ordinary island life (Buckingham J, 2011).

In Fiji, former patients are rehabilitated with support of the Leprosy Trust Board that help provide educational support housing assistance and small business grants. In addition, a major activity of the leprosy program is the dermatological screening of the population through its skin clinic conducted at the PJ Twomey Hospital.

Approximately 15,000 people are screened for the disease annually at the skin clinic. Similar clinics were established in Labasa Hospital in 2003, Savusavu and Taveuni in 2005. In addition, general skin screening is conducted in villages, settlements and schools where new cases are detected. In addition, periodic screening activities occur in endemic areas.

CONCLUSION
Leprosy continues to be a prevalent condition affecting the disadvantaged or rural communities in Fiji. Despite the achievement of elimination targets 20 years ago, the disease has shown two surges in incidence rates. This is largely attributable to the long incubation period of the disease, the presence of ‘hidden cases’ in the community and social impacts of the disease. Most patients have been rehabilitated with the assistance of the Leprosy Trust Board.

REFERENCES
Surgical technique: scrotomectomy and plasty of the scrotum in the surgical treatment of large hydroceles in lymphatic filariasis endemic countries

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Keywords: hydroceles, plasty, reduction of the scrotum, scrotomectomy, surgical technique.

ABSTRACT
This work describes the various methods of resection-plasty of the excessive scrotum that we developed and use as a complement to the resection of the vaginalis in the surgical treatment of large and very large hydroceles in filarial endemic countries. Patients/Methods: The procedures described have been developed during 12 years of practice in lymphatic filariasis endemic countries. They were formalized in a recent series of 50 resection-plasty of the scrotum, complementary to hydrocelectomy, in a homogeneous and continuous series of 148 hydrocelectomy performed on 117 patients by the same operator in Fiji (2009-2011). The results of this series are reported elsewhere. The encouraging results seem to justify the description of the techniques used in its different variants.

INTRODUCTION
During our long practice of surgery in several Pacific countries endemic for lymphatic filariasis, we noticed that the peroperative and/or postoperative retraction of the scrotum after hydrocelectomy does not always materialize, contrary to a commonly held belief.

The persistence of a too large scrotum for an intrascrotal content which returned to its normal or subnormal volume after hydrocelectomy, must be kept in mind. The aesthetic embarrassment it causes is sometimes admitted by the patient and is real. The functional impairment, most often unacknowledged, cannot be ignored. The literature does not offer any surgical technique for the plasty of the excessive scrotum that could be called the “silent burden” of patients who had a hydrocelectomy.

SURGICAL TECHNIQUE: PLASTY OF REDUCTION OF THE SCROTUM
This work is the result of 12 years of practice of “extended” general surgery, first in the continuity and then through regular missions in countries endemic for lymphatic filariasis. We already reported our conclusions and our proposed clinical classification of hydroceles1. We also already commented on the clinical examination and surgical treatment of large and very large hydroceles in lymphatic filariasis endemic countries 2.

The quality of the results, despite some usual postoperative complications which remain within those published in the literature, justify this work that might be of interest to surgeons.

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FIELD NOTE
while maintaining or restoring a sphericity, as close as possible to normal, to the scrotal mass. This can be achieved by changing the sagitta of each circle arc that each curve represents in polycurveplasty.

Hence, to raise the lower pole of the right hydrocelic purse above the lower pole of the left purse, which is not affected by a hydrocele or which has a hydrocele of a lower stage, the sagitta of the curves on the antero-lateral and postero-lateral sections on the right side will be longer than the ones on the left in order to take a larger area on this side of the scrotum.

**Technique**

*Incision*

The incision is located halfway between the two poles. It is curved with a lower or upper concavity, arranged horizontally on the front of the purse concerned, respecting the median raphe. If necessary the incision can be antero-laterally enlarged. In hydroceles stage III or IV, the incision is anterolateral. If the necessity of a resection of the scrotum is confirmed by an insufficient or an absence of scrotal tonicity after treatment of the hydrocele, the incision is enlarged towards the back on the postero-lateral and posterior sections of the purse concerned. A lower contra-incision is made following a parallel design. The distance between these two incisions is variable depending on the extent of surface of excessive scrotum to be removed. If a resection of the scrotum is anticipated, the drawing of the incision line is done before the beginning of the operation according to the type of plasty considered.

**Methods:** the different types of resection-plasty of the scrotum

We use two main categories of resection-plasty: unilateral plasty focusing on one purse only or bilateral plasty including the two purses. Each group includes several types of plasty.

Two concepts must be kept in mind:

- the contraction of the scrotum, even limited, may continue after surgery,
- the scrotum of elderly is less retractile, with some exceptions. It is the same for the underlying dartoic bag which is also resected.

The incision and contra-incision lines should bewinding without acute angles between curves. As much as possible, a preliminary drawing should be done on the scrotum.

**Unilateral resection-plasty**

They are indicated in unilateral hydrocele and extend from the anterior meridian (median raphe) to the posterior meridian of the purse concerned.

According to the drawing of the line of incision and of the flap to be resected we distinguish three types of plasty: in lying crescent moon, in lying italic S, in “chapeau de gendarme”.

1) **Resection-Plasty Antero-Latero-Posterior (PALP) uni-curve in “lying crescent moon”**

The resection concerns the anterior, the antero-lateral, the postero-lateral and the posterior sides of the purse: from the anterior meridian (median raphe) to the posterior meridian. Thus, we get the following designs and resection-flaps: in crescent moon with a superior concavity: “crescent moon lying on its back.” The resection concerns the upper hemisphere of the purse. Figure 1 - in crescent moon with a lower concavity: “crescent moon lying on its stomach.” The resection covers the lower hemisphere. Figure 2

2) **Resection-Plasty Antero-Latero-Posterior (PALP) bi-curves italic “S”**

Here, the incision draws a lying italic “S” extending horizontally from the anterior meridian to the posterior meridian, straddling the equator line, centered by the medio-lateral meridian. There are two types of flaps: “normal” italic “S”, looking down. Figure 3

- “inverted” italic “S”, looking up. Figure 4

The excised flap (operating piece) as the shape of an italic “S”.

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3) Resection-Plasty Antero-Latcro-Posterior (PALP) tri-curves in « chapeau de gendarme »
The incision line is even more winding than in the two previous types of resection-plasty. It describes three successive curves, one on each side of the purse concerned from the anterior meridian to the posterior meridian. We describe two types of flaps:
• “chapeau de gendarme” Figure 5
• “reversed chapeau de gendarme.” Figure 6

As in previous plasty, the shape is drawn based on the anticipated design before resection. The operating piece will have the same shape.

Bilateral Antero-Lateral Resection-Plasty (BAL)
These scrotomectomy concern both sides of the scrotum. Developed for bilateral hydroceles, they may also apply in particular cases to unilateral hydroceles. They concern the anterior and anterolateral sides of both purses, from one medio-lateral meridian to another. They do not include the posterolateral and posterior sides. We identify two types.
1) “ Lying crescent moon “BAL
The resection-plasty concerns both front sides as well as the left and right anterolateral sides. The incision extends from onemedio-lateral meridian to the other. It has an upward or downward concave curve, centered on the anterior meridian (median raphe). The contra-incision follows the same design. Incision and contra-incision draw either:
• a “crescent moon lying on its back”: in this case the upper limit (incision) is at the level of the equator. The lower limit of resection is on the lower hemisphere. The resection focuses mainly on the lower hemisphere Figure 7
• a “crescent moon lying on his stomach”: the lower incision does not go above the equator level. The upper contra-incision limits on top the resection flap Figure 8

2) Tri-curves BAL.
Here the design of the incision, extending on the anterior and anterolateral sides of each purse, is a succession of alternating up or down concave or convex curves. The upper incision corresponds to the initial incision. It extends from a medio-lateral meridian to the other, without expending behind it while describing a sinuous line centered on the medio-anterior meridian. The distance of the inferior contra-incision depends on the surface of scrotum to be removed. It follows the same design as the former incision and joins it on both ends, on themedio-lateral meridians.

We distinguish two main groups of tri-curves BAL depending if the flap- possibly mobilized – is superior or inferior.
Each of these two groups includes four variants depending on the design of the initial incision (order of alternating convex and concave curves) and of the resection-flap resection (operating piece)
Antero-superior tri-curves BAL
The name of the flaps is defined by the downwards orientation of the curves of the superior incision line (initial incision). The resection is at the expense of the lower hemisphere in its anterior half. The top flap is mobilized down if necessary. Based on the curves alternation we distinguish four types of Antero-superior tri-curves BAL:
a) tri-convex Figure 9  b) tri-concave Figure 10
c) convex biconcave Figure 11  d) concave biconvex Figure 12
Postero-inferior tri-curves BAL
Here the name of the curvatures as convex and concave is defined by their upward orientation. The initial incision of the hydrocele, winding, three-time curve, extends on the upper half of the scrotal mass near the equator line or straddling at its ends, on the anterolateral sides, from a medio-lateral meridian to the other.

We identify four types of postero-inferior tri-curves BAL based on the alternation of concavity or convexity which are oriented upward, direction in which the flap will be mobilized:

- a) tri-convex Figure 13
- b) tri-concave Figure 14
- c) convex biconcave Figure 15
- d) concave biconvex Figure 16

Resections of the Lower Polar Cap (RCPI)
These expanded scrotomectomy are resecting the entire lower pole of the two purses in one piece, with a circumferential adjacent skin surface, more or less extended in height from the lower pole of the scrotal mass, depending on the size of the excessive scrotum to be removed. The incision and contra-incision must be drawn in a plane that intersects more or less obliquely the mass, generally spherical, of the purses and not following a parallel of the sphere that perpendicularly intersects the bipolar axis. The forwards inclination of this plan determines the antero-superior flap, the largest in this case. After resection, the suture will be on the rear or more likely on the front side considering that the scrotum of the posterior face is thinner and more flexible, and therefore more easily mobilized forward and up.

The backwards inclination of this plane determines the postero-inferior flap, the largest in this case; in any case the suture is on the front of the scrotal mass.

The incision line is drawing a circular winding design on all faces of the scrotal mass. It shows a pattern of alternating curves, concave up or down. The incision is located in a section plane of the sphere.

This section plane is orientated obliquely downwards and backwards.

We thus identify two main groups of flaps: antero-superior and postero-inferior flaps. Here the flap refers to the portion of the scrotum which is the most expanded downward (orthostatic position) which we will bring on the other and smaller portion, for their edge-to-edge suture. These flaps are designed so that in no case the suture line is located on the neo-pole of the purses.

Each of these two major groups includes four types of flaps. This is to be able to deal with all possible anatomical varieties of hydrocele by shape, condition of the scrotum and (as for unilateralplasty) degree of burial of the penis.

- The Antero-Superior flaps (LAS) include: a) tri-convexe LAS b) tri-concave LAS c) convex biconcave or mixed convex LAS d) concave biconvex or mixed concave LAS. Figures 17 to 20.

- The Postero-Inferior flaps (LIP) include: a) tri-convexe LIP b) tri-concave LIP c) convex biconcave or mixed convex LIP d) concave biconvex or mixed concave LIP. Figures 21 to 24.
RESULTS
All these proposed techniques of resection-plasty of the scrotum were used. The results published relate only to a series of 50 resection-plasty recently performed in the continuity by the same team and the same surgeon, out of a series of 117 patients with 148 hydrocele, simple or complicated by hematocles or chyloceles. Some techniques are not included in these results, as they were not used in this series and because they are less used. However, the variety allows the surgeon to cope with all scenarios. Results and indications have been discussed elsewhere.

REFERENCES
A Publication Profile of Dr Ratu Jona Ulunairai Mataika

Dr Mataika attended primary school at Naduri in Macuata. He went to Bucalevu before attending Queen Victoria School at Nasinu in 1938 – 1942. He graduated from the Fiji School of Medicine in 1946. His first posting was to Levuka Hospital in 1947. He died in Suva on February 27 1999.

Dr Mataika was renowned in the medical profession locally and internationally for his role as a pioneer of the filariasis programme in Fiji.

He was a pioneering figure in the establishment of the virology & filarology services in the country and the region. (MOH, 1999). He spent 51 years of service in the profession.

Dr Mataika served on a World Health Organisation sponsored steering panel on parasitic diseases. His findings have been published widely and used in medical research. Dr Mataika was of noble birth from Nairai Island, in the Lomaiviti Province. He served for many years on the Lomaiviti Provincial Council and was a member of the (Bose LevuVakaturaga) Great Council of Chiefs from 1992 -1994.

He was made an Officer of Order of the British Empire in 1986 for his contribution to medical services. He retired in 1987 and was re-employed the same year to contribute work in the virus laboratory and national filariasis programme.

Publications


REFERENCE

1. The London Gazette (1986); Fifth Supplement, Her Majesty’s Stationery Office; 1986

2. MOH (1999); Annual Report.