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# Contributing Factors to the Resurgence of Leprosy Cases in Timor-Leste

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## Abstract

Leprosy is a chronic, ancient, and communicable disease caused by Mycobacterium leprae (M. leprae),  can damage skin and peripheral nerves [1]. In 1991, the 44th World Health Assembly set a target for the elimination of leprosy from the world as a public health problem by 2000. Elimination was defined as a prevalence of less than 1 case per 10 000 populations [2]. In 2019 WHO report reveal only 200 000 Leprosy cases were reported from 118 countries [3]. Timor Leste declared elimination of Leprosy as Public Health Problem in 2011, but soon after that Leprosy cases were increased again.[4] New case detection rate   increased from  6.3 (2012) to   8.1 per 100,000 (2019).[5] The Majority (86,7%) of new cases were reported from 5 municipalities of Oecusse, Baucau, Dili, Manatuto, Ainaro [6].

Objectives: We conducted this study to identify contributing factors to the resurgence of Leprosy cases in the four Municipalities of Timor Leste.  Cross-sectional Study with quantitative analytical approaches was used for this study. We enrolled 403 participants from 12 Community Health Centers in the 4 municipalities that reported high prevalence of Leprosy cases.

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About 68.5% of participants interviewed reported Leprosy cases, being male, mostly affected productive ages group, and with unknown income. Three health system components of stewardship, ICT, and Services Delivery were found to be associated with the resurgence of Leprosy cases. Delaying in making decision and delaying in accessing Leprosy care were contributing to the increased of Leprosy cases in the community. Leprosy patients experience high level of stigma and received less family and community support. Strengthening the active case finding with bacteriological confirmation by trained health professional; early commencing Rifampicin Preventive Therapy for close contacts; and engaging family and community in health promotion on Leprosy are important recommendations derived from this study. This study was conducted from September 1 to December 31, 2021 and enrolled 403 participants. About 68.5% of participants reported Leprosy cases in the community. Stewardship, Financial, ICT; and delays in making decision to visit health facilities were associated the resurgence of Leprosy cases in Timor Leste.

*Keywords:* Identification; Contributing; Factors; Increase; Leprosy .

## 1. Introduction

Leprosy has been classified by WHO as one of twenty NTDs, and its occurrence is often related to poor socio-economic conditions [7]. Leprosy or Hansen is caused by Mycobacterium leprae (M. leprae), with a long incubation period [8]. Transmitted by droplets from the nose and mouth during prolonged and close contact with untreated leprosy patients. It affects the skin and peripheral nerves and, if untreated, can progress to permanent impairments to the skin, nerves, face, hands and feet, and causes disabilities and social exclusion [9].

In 1991, the 44th World Health Assembly set a target for the elimination of leprosy from the world as a public health problem by 2000 [2]. Elimination was defined as a prevalence of less than 1 case per 10 000 population [1]. With the availability Multi drug therapy (MDT) the leprosy elimination was belief to be possible [10]. In 2019, just over 200 000 cases of leprosy were detected from 118 countries, with around 5% of cases had visible deformities at the time of diagnosis [3]. In 2019, Ten countries of South-East Asia (WHO-SEARO) region continue reporting Leprosy prevalence rate $\geq 1$ cases per 10.000 populations ; and New cases with G2D reported at rate of 2.4/million population [3]. Despite the global reduction, Leprosy cases resurgence have been reported from many settings [11,12,13].

**Factors Influence Leprosy Control Program:** Despite the availability of medicines known as MDT (Multi-drug therapy) to treat Leprosy, there is evidence that relying on MDT alone cannot interrupt the diseases transmission and eradicate Leprosy. High social stigma, deficiencies/disability prevention, and the relation between Leprosy and poverty continue become big concern [10]. There are other factor contributing to the resurgences Leprosy cases such as complacency, health services delays, health system factors, socio-economic, close contacts, individual and Community factors [14,15,16].

**Health System Components in Leprosy Control Program:** WHO defined a health system consists of all organizations, people and actions whose primary intent is to promote, restore or maintain health. This includes efforts to influence determinants of health as well as more direct health-improving activities [17]. The Leprosy

control program as guided by global and national policies framework within health system has responsibity to delivery services to improve, secure, and restore individual health conditions and its community. This include care provided in hospitals, family doctors, and invisible services such as prevention and control of infectious diseases, health promotion, health workforce plan, and improving social, economi and environmental conditions [3,6,18]. A. Tiwari and J. H. endri. Richardus (2016) identified health system components that need to considers for moving from control to eradication of Leprosy. They found that integration of Leprosy control program into the general health care system has been shown to decrease the level of stigma. Community based rehabilitation (CBR) is effective in integrated settings [19].

Delays for Accessing Leprosy Services

Delays for Accessing Leprosy Services: Health care services define as services that provide medical treatment and care for public or particular group [20]. The right organisation and well function health system will deliver key characteristics of health care services such as comprehensive, accesibility, coverage, continuity, quality, center of attention to people, coordenasaun, accountability and Eficience [21]. To the present date, many health systems continue struggle to ensure its citizen timely accessing health care services, especially to its under-privilege and rural population. WHO (2016) Global Leprosy Strategy 2016–2020 has recommended for countries that "Leprosy interventions should focus on detected cases without any delay" [22]. There is well known concept of "Three Delays" model for pregnancy-related mortality caused by delays in : (1) deciding to seek appropriate medical help for an obstetric emergency; (2) reaching an appropriate obstetric facility; and (3) receiving adequate care when a facility is reached [23]. Given the complexities for managing and eradicating Leprosy, this model is worth utilizing to assess Leprosy services delays.

Experiencing from other settings suggest that many suspected leprosy experiencing delays in making decision, reaching health facilities, and receiving proper care once arrived in health facilities. Mary Henry and his colleagues (2016) observed that many patients were ignorant to the early symptoms of leprosy, and that the negative image surrounding leprosy within communities contribute to delays seeking treatment due to the fear of being isolated. They also noted that doctors often do not reach a conclusive diagnosis of leprosy promptly [15]. Thirumugam Muthuvel and his colleagues (2017) observed in their study that patient delay is larger than health care provider delay. Many patients were ignorant of early symptoms of leprosy. They also noted that limited community activities and misdiagnosis appears to be contributing to overall delay in diagnosis in areas of Maharashtra, India [24].

**Stigma and Discrimination for Leprosy Patients and Families:** The high social stigma, prevention of disabilities, and the relationship between leprosy and poverty are still major concerns for eliminating Leprosy [10]. Stigma and discrimination are deeply embedded in many communities, including healthcare settings, and result in exclusion and denial of human rights. Knowledge-based leprosy awareness programmes have proven insufficient to change community attitudes [3]. In their study M. Henry and his colleagues (2016), concluded the need for patient education regarding leprosy symptoms and the reduction of stigma to encourage patients to present and the need to increase clinician suspicion of leprosy and further education regarding disease symptoms in medical school curriculums [15]. WHO (2021) in its Global Leprosy Strategy 2021–2030, continue

established  strategic pillar to combat stigma and guaratntee human right through following points  a) Adopt United Nations principal and guidelines for elimination of discrimination against patients Leprosy and their families, b) Inclusion from organisation and networks with Leprosy patients, c) Amend discriminatory law, d) intervention and process to reduce and monitoring stigma in relation to Leprosy in the community, and  e) Access to social support and rehabilitation [3].

**Characteristic Individual with Leprosy:**   The high social stigma, prevention of disabilities, and the relationship between leprosy and poverty are still major concerns for eliminating Leprosy.[10] Stigma and discrimination are deeply embedded in many communities, including healthcare settings, and result in exclusion and denial of human rights. Knowledge-based leprosy awareness programmes have proven insufficient to change community attitudes [3]. In their study M. Henry and his colleagues (2016), concluded the  need for patient education regarding leprosy symptoms and the reduction of stigma to encourage patients to present. The need to increase clinician suspicion of leprosy and further education regarding disease symptoms in medical school curriculums [15]. WHO (2021) in its  Global Leprosy Strategy  2021–2030, continue  established strategic pillar to combat stigma and guaratntee human right through following points  a) Adopt United Nations principal and  guidelines for  elimination of  discrimination against patients Leprosy and their families, b) Inclusion from organisation and networks with Leprosy patients, c) Amend discriminatory law, d) intervention and process to reduce and monitoring stigma in relation to Leprosy in the community, and  e) Access to social support and rehabilitation [3].

**Timor History and Context:** Timor Leste is a developing nation with a population of 1,3 million, gained its independence in 2002. Health and education have been a high government priority since independence.  The Article 57 of Timor Leste Constitution guarantees the fundamental right  Timorese citizens to access free health care [25]. In the close to twenty years since independence, health outcomes improved substantially, with significant reductions in child and maternal mortality, and major communicable diseases, and  life expectancy increased by 10 years to 68.6 years [26].  Timor Leste  National Program for Leprosy Elimination was establshed in 2003 through collaboration between MOH, WHO and TLMI. The Programa has been well adpated and suceed in reducing national Leprosy prevalence rate to  <1/10.000 population  in 2010 [6]. In 2011, Timor Leste declared the elimination of Leprosy as a public health problem [4].

However, during the last a few years, the new leprosy cases were increasingly notified over the years.  The annual leprosy cases continue higher than 100 cases since 2013. New case detection rate   increased from  6.3 (2012)  to   8.1 per 100,000 (2019). Proportion of   G2D between new Leprosy cases was gradually increased from 5.7% (2012) to  19.4% (2019). The rate of new  G2D cases was   15.4 per miliaun populasaun iha tinan 2019.[6] The municipalities of   Ainaro, Baucau, Manututo, and Oecusse have a high prevalence rate of > 1 por 10.000) and higher NCDR >10/100.000.  The Majority (86,7%) of new cases were reported from these 5 municipalities [6]. The recent external assessment for Timor Leste Leprosy Control Program identified numbers of health systems challenges such as : a) dificult to mantain contact with Leprosy Patients, b) dificult provide services to leprosy patients in remote areas, c). Health care workers do not performed   Sensory Test (ST) and Voluntary Muscle Test (VMT) in health facilities, d) Unregular  registered  of Leprosy cases,  and e) inadequated supply of leprosy medications [4].

**The research objectives are**: 1. To identify why leprosy cases are increasing in 4 municipalities in Timor Leste. 2. Provide evidence to the National Leprosy Program Manager and partners (including TLM-TL) to develop action plan and activities, based on the reality on the ground. 3. Provide local evidence to health personnel in order to guide the delivery of more appropriate, quality, inclusive and accessible Leprosy diagnostic and treatment services in the 5 Municipalities. 4. Enrich and contribute the knowledge on Leprosy Services and Control program in Timor Leste.

## 2. Data and Method

### 2.1 Design

Was used a cross-sectional design with Quantitative Analytics approach in this study. Place and time: The research was conducted in Baucau, Dili, Manatuto and RAEOA municipalities which reported increasing Leprosy Cases notification in 2019. Three Communities Health Centers compose of two CHC that reported high notification cases, and 1 reported zero or less. All health posts and villages (*sucos*) belong to the coverage areas under these CHC were visited to conduct interview with health staffs, patients and community members. Data was collected from 1 September to 31 December 2021.

### 2.2 Population and sample

Population: All Timor-Leste Population, including all health professionals of Baucau, Dili, Manatuto, and RAEOA municipalities with a total 494,716 people. Inclusion criteria Age between 12-60 above, Male & Female, permanently residents of Baucau, Dili, Manatuto, and RAEOA municipalities and Exclusion criteria are: Refuse to be interviewed, Sick/unfit to be interviewed, People with mental deficiencies was used. Samples: sample size of 383 peoples and we added 10% to the sample size in order to anticipate any technical failure during the field data collection. So, the total sample size is 422 peoples. During period of field data collection, enumerators were only succeeded in collecting 403 samples that fulfil the criteria and eligible for further analysis after completed data cleaning procedures.

### 2.3 Technical sampling

Was used Non-Probability Sampling (non-random) using Purposive Sampling.

### 2.4 Variables

Independent Variable (IV): Health System, Services Delay, Stigma, Individual Characteristics and Dependent variables: Leprosy Status (Cases).

### 2.5 Instrument of data collection

Structured Questionnaires was used in the study, validated and tested for 1000 participants in Liquica Municipality. The interviewed results were entered into SPSS for Validity Test with r Product Moment Pearson,

and the reliability Test with Cronbach's Alpha > 0,60. The final questionnaires were then utilized to train 12 field enumerators and 3 field supervisors responsible for conducting field interview.

### *2.6 Data Management and analysis*

Data management: was applied all interviewed data were entered by two independent research assistants into MS Excel sheet in accordance designed for this study. The data then checked by Co-Investigator responsible for field data collection to ensure the correct entry and check any missing or wrong places data.

Data Analysis: The corrected database in MS Excel format was sent to Co-Investigator (statistician /Epidemiology) responsible for cleaning and analyzing data. In close consultation with Principal Investigator the database was transferred into SPSS version 22, 2016 for statistical analysis included Bivariate $X^2$ (Chi-Square) with 2*2 table to test the association. Logistic Regression further identified the correlation between the independent and Dependent Variables. In the end, technical report sent to author correspondent for manuscript development and then submit to editor for publication.

### *2.7 Ethical approval*

ethical approval letter for our study was obtained from the technical and ethics committee of *Instituto Nacional de Saúde* (INS)-MoH Timor-Leste with No.Ref.:1025/MS-INS/GDE/IX/2021.

### 3. Result

**General Information:** We were able to interview 403 participants composed of 220 males and 183 females in this study to include in the final database for analysis. The data were collected from 4 Municipalities, 12 CHCs, and 24 health posts/*sucos* locations. With the average of 100 participants interviewed for each municipality, composed of health care workers, health managers, local leaders, patients, family's patients, and communities' members.

**Leprosy cases/close contact status:** Total of 276 (68.5%) participants interviewed answered "Yes" to the questions administered by enumerator during the field data collection. The yes answers mean that 68.5% of persons enrolled in this study either had /ever had/ have Leprosy diseases, and history of Leprosy cases during the interview. All 12 CHCs and municipalities enrolled in this study reported post Leprosy cases status (figure-4a & 4b).

**Individual Characteristic :** From the 276 respondents said yes (68.5%) to Leprosy cases or close contact status, compose of 53% males and 47% females (figure-5), most of them are married (figure-6). The majority (242/87.7%) of them represent a productive age 17-54 (Figure-7). Interesting to see that the two-third (75%/128) of them have a higher education (Figure-8), but high percentage (62%) of them with unknown and non-regular income (figure-9).

**Table 1:** Result test of bivariate with chi-square of health system, delays, stigma, and individual characteristic with Lepra cases /contacts.

**Analytical Presentation of Factors Associated with the Increase of Leprosy Cases**

| No | Variable | Lepra Case (Y) | | | COR | 95% CI | | P Value |
|----|----------|----------------|---|---|-----|--------|---|---------|
| | | Yes N(%) | No N (%) | Total N(%) | | Upper | Lower | |
| 1 | Stewardship (X1) | | | | 1.753 | 1.147 | 2.679 | 0.009 |
| | Yes | 158 (74,2) | 55 (25,80 | 213 (100) | | | | |
| | No | 118 (62,1) | 72 (37,9) | 190 (100) | | | | |
| 2 | Human Resources (X2) | | | | 1.207 | 0.785 | 1.854 | 0.391 |
| | Yes | 119 (70.8) | 49 (29.2) | 168 (100) | | | | |
| | No | 157 (66.8) | 78 (33.2) | 235 (100) | | | | |
| 3 | Budget Lepra (X3) | | | | 1.567 | 1.006 | 2.438 | 0.046 |
| | Yes | 197 (71.6) | 78 (28.4) | 275 (100) | | | | |
| | No | 79 (61.7) | 49 (38.3) | 128 (100) | | | | |
| 4 | Disp. Equipment (X4) | 184 (70.5) | 77 (29.5) | 261 (100) | 1.299 | 0.840 | 2.007 | 0.239 |
| | Yes | 92 (64.8) | 50 (35.2) | 142 (100) | | | | |
| | No | | | | | | | |
| 5 | ICT Lepra (X5) | | | | 0.748 | 0.489 | 1.143 | 0.179 |
| | Yes | 141 (65.6) | 74 (34.4) | 215 (100) | | | | |
| | No | 135 (71.6) | 53 (28.2) | 188 (100) | | | | |
| 6 | Health Services (X6) | | | | 1.591 | 1.024 | 2.472 | 0.038 |
| | Yes | 196 (71.8) | 77 (28.2) | 273 (100) | | | | |
| | No | 80 (61.5) | 50 (38.5) | 130 (100) | | | | |
| 7 | Delay -3 (X7) | 270 (68.7) | 123(31.3) | 393 (100) | 1.463 | 0.406 | 5.279 | 0.559 |
| | Yes | 6 (60.0) | 4 (40.0) | 10 (100) | | | | |
| | No | | | | | | | |
| 8 | Delay -2. (X8) | 73 (76.8) | 22 (23.2) | 95 (100) | 1.716 | 1.008 | 2,921 | 0.045 |
| | Yes | 203 (65.9) | 105(34.1) | 308 (100) | | | | |
| | No | | | | | | | |
| 9 | Delay-1 (X9) | | | | 1.606 | 1.044 | 2.471 | 0.030 |
| | Yes | 134 (74.0) | 47(26.0) | 181 (100) | | | | |
| | No | 142 (64.0) | 80 (36.0) | 222 (100) | | | | |
| 10 | Stigma (X10) | | | | 1.058 | 0.691 | 1.620 | 0.794 |
| | Yes | 119 (69.2) | 53 (30.8) | 172 (100) | | | | |
| | No | 157 (68.0) | 74 (32.0) | 231 (100) | | | | |
| 11 | Characteristic Individual (X11) | 71 (65.7) | 37 (34.3) | 108 (100) | 0.842 | 0.527 | 1.346 | 0.473 |
| | Yes | 205 (69.5) | 90 (30.5) | 295 (100) | | | | |
| | No | | | | | | | |

Result test of bivariate with chi-square for health system, delays, stigma, and individual characteristic with leprosy cases is presented in table-6 The result reveal five variables are associated with the increase of Leprosy cases. They are including Stewardship; Health Services, Financing; Delay accessing health care services (delay-2); and Delay in making decision for visiting health facilities (delay-1) with the increase of Leprosy cases.

However, after adjusting with Logistic regression test (table-2), the results reveal only three variables from health system components have strong association (correlation) with the increase of Leprosy cases. Delays in making decision to visit health also show highly significant associated with the increasing of Leprosy cases.

**Health System Components**

Below is descriptive information from three health system components that were found to have strong association with the resurgence of Leprosy Cases in four Municipalities of Timor-Leste.

**Table 2:** Result of logistic regression test

| Variable | Adjusted OR | 95% C | | P Value |
|---|---|---|---|---|
| | | Lower | Upper | |
| Stewardship (X1) | 3.530 | 1.338 | 7.831 | 0.006 |
| ICT Program (X5 | 2.754 | 1.108 | 5.779 | 0.017 |
| Health Services (X6) | 1.617 | 1.389 | 4.981 | 0.041 |
| Delay making decision visit Health Facilities (X9) | 1.349 | 1.799 | 2.276 | 0.003 |

**Stewardship**: Results of interviewed with 403 respondents with 18 questions covered policy framework, structure and supervision, monitoring and evaluation; coordination and collaboration, and accountability are presented in table-3. The data reveal very low answer on availability of stewardship component in the municipality's leprosy control program, which range from 12.9%to 40.4% for each question. Reflecting the big issues of leadership and governances in managing leprosy control program in municipalities, CHCs and health posts level.

**Table 3:** Leadership & Governance

| No | Leadership & Governance | Available % |
|---|---|---|
| 1 | Policy and Strategy Documents for Leprosy available in the MOH 12.9 | 12.9 |
| 2 | Guidelines/STG for guiding identification and case detection | 20.1 |
| 3 | Program for community empowerment seeking diagnostic and treatment | 13.4 |
| 4 | Program to enhance technical and management capacity in health facilities | 18.9 |
| 5 | Guidelines /SOP for screening of close contact family's members | 30.0 |
| 6 | Guidelines/SOP for Leprosy Treatment | 15.6 |
| 7 | Document for monitoring and evaluation of Leprosy program Implementation | 30.5 |
| 8 | Regular supervision from National, Municipal, CHC. | 26.6 |
| 9 | Regular daily activities for controlling Leprosy Diseases | 40.4 |
| 10 | Document on collaboration with Community for Leprosy Program | 35.7 |
| 11 | Document outline regular leprosy program implementation? | 31.8 |
| 12 | Structure of Leprosy Program in each level of health facilities | 18.9 |
| 13 | The Leprosy Activities in CHC, Health Posts, SISCa and SnF | 28.8 |
| 14 | Supporting facilities to manage Leprosy Program | 37.7 |
| 15 | Activities to influence individual, family and community on Leprosy | 34.0 |
| 16 | Collaboration program with civil society in the implementation of Leprosy program in the lower level | 33.7 |
| 17 | Regular coordination meeting to secure leprosy programa/services | 35.2 |
| 18 | Mechanism to follow-up the results of Leprosy Program Implementation | 28.0 |

*Information, Communication, And Technology (ICT)*

Results of interviewed with 403 respondents with 5 questions covered health promotion & prevention; Information dissemination; and digitalization are presented table-4. The data reveal very low answer on

availability of ICT component in the municipality's leprosy control program, which range from 15.6% to 44.4% for each question. Reflecting the lack of health promotion, prevention, information disemination and utilisation of digitaliasaun in municipalities level CHCs and health posts in regard to Leprosy diseases.

**Table 4**: Information, Communication and Technology

| No | Information, Communication, and Technology | Available % |
|----|--------------------------------------------|-------------|
| 1 | Regular health promotion and prevention of Leprosy to Vulnerable people | 35.5 |
| 2 | Regular Information Dissemination on Leprosy to General Community | 40.7 |
| 3 | Information on Leprosy provided through School Health Activities | 34.0 |
| | | |
| 4 | Leprosy program utilizes TV, Radio, Journal and Social Media to disseminate information | 44.4 |
| 5 | Leprosy Program utilizes digital technology (computer, internet) to manage Leprosy activities in health facilities | 15.6 |

*Service Delivery*

The Results of the interview with 403 respondents with 5 questions with 2 questions on distance of health facilities, and quality of services for general disease; and 3 questions for Leprosy diseases services prociments, norms, and dignity of users are presented in table-6. The data reveal good score for delivering of general health services to communities. However, there are low score when asking about prociments, norms and standard care with dignity for Leprosy cases. Reflecting less quality of health care for Leprosy patients.

**Table 5:** Health services

| No | Health Services | Yes % |
|----|-----------------|-------|
| 1 | Closer health facilities to diseases consultation | 80.6 |
| 2 | Good and quality of services delivery to patients and communities | 70.5 |
| 3 | The delivery of health services to patients and communities affected with Leprosy conformed to the normal prociments. | 39.2 |
| 4 | Service provided by health professional to patients and communities affected with Lepra follow the norms | 41.2 |
| 5 | Leprosy patients received services and treatment with dignity. | 48.9 |

*Stigma and Discrimination*

Stigma does not found to be associated with resurgence of Leprosy cases, but the data presented in table (6) reveal high scores of stigma from health professional, communities Table-6: Stigma /Discrimination procediments, norms and standard care with dignity for Leprosy cases. Reflecting less quality of health care for Leprosy patients and families toward Leprosy Patients health promotion, prevention, information dissemination and utilization of digitalization in municipalities level CHCs and health posts in regard to Leprosy diseases. Leprosy patients also receive less supported from government, civil societies, communities and family members.

**Table 6**

| No | Stigma /Discrimination | Yes % |
|---|---|---|
| 1 | There is discriminative attitude from health Professional to Leprosy Patients | 67.0 |
| 2 | There is discriminative words coming from health professional to Leprosy Patients. | 68.5 |
| 3 | There is ignorant attitude from health professional toward Leprosy Patients | 71.2 |
| 4 | Health Professional look at a face when talking to Leprosy patients | 41.9 |
| 5 | There is a discriminative attitude from Community toward Leprosy Patients | 51.1 |
| 6 | There is a discriminative attitude from family toward leprosy patients | 52.4 |
| 7 | There is support from family for Leprosy patients | 38.0 |
| 8 | There is recognition from family to its family members affected with Leprosy Diseases | 39.0 |
| 9 | There is government organization strive to implement better program to eradicate Leprosy diseases | 28.8 |
| 10 | There is Civil Society Organization provide support Leprosy patients | 39.7 |

**4. Discussion**

Our findings indicate much higher Leprosy cases in the community than previously reported from the health facilities in the four Municipalities of Timor Leste 2019 and confirmed the resurgence of leprosy in the country [1,2]. However, the findings must be further confirmed with bacteriological examination to determine presence of acid-fast bacilli in a slit-skin smear taken from these communities or by identifying two other cardinal sign of Leprosy by trained health professional [3]. In recent years, Leprosy resurgence situation have been increasingly reported from many settings due to various factors. Geetha and his colleagues reported the occurrence of Leprosy cases caused by the persisting pool of infection in Kerala, India [4]. In Kenya, Nyamogoba and colleagues observed continued endemicity and increasing incidence of leprosy in some regions and assumed the existence of unique human, M. leprae or environmental factors that favor prolonged survival and transmission of M. leprae [5]. Whereas, Kombate and his colleagues in Togo, through their retrospective study of 2630 Leprosy cases over 15 year confirmed the elimination of leprosy in Togo. But fear of resurgence due to the high incidence of leprosy in some areas of the country [6]. **Individual Characteristic**: The majority of Leprosy respondents represented productive ages age group, being male, with unknown sources of incomes. These individual characeristics have similiarities with Leprosy patients globally. In their systematic review of Investment case concepts in leprosy elimination, TIWARI & RICHARDUS (2016) found that females contributed only 38% to the new Leprosy cases in 2014 [7]. Mahajan and his colleagues (2021) retrospectively reviewed the medical records of leprosy patients registered from 2009 to 2020 at Dermatology Clinic of Dr. Rajendra Prasad Medical College, Kangra (Tanda), Himachal Pradesh India, found the majority (73.8 %) were male, and 76.9% patients were aged 21-60 year [8]. Unknown sources of income found in this study may indicates unemployment and lower socio-economic status of Leprosy patients. There is well establihed link between lower socio-economic status, social isolation, discrimination and the burden of Leprosy [9,10]. Therefore, it is important for National Leprosy Control to considers these individual characteristics to design intervention that specifically targeted these characteristics. **Health System Components (HSC)** consist of management and governance; policy frameworks, human resources, essential medicines, and services delivery were previously utilized for Leprosy researches [7,11,12]. In this study, we found that Stewardship, ICT, and Services Delivery were associated with the resurgence of Leprosy cases in the four municipalities included in this study. These findings consistent with the recent external review conducted to the National Leprosy Control

in Timor-Leste [2]. Strengthening health system have been considered as an important factor controlling Leprosy and other infectious diseases. TIWARI & RICHARDUS (2016) identified health system components that need to considers for moving from control to eradication of Leprosy [7]. MOH Timor Leste may consider to further strengthening its system components to achieve Zero Leprosy goal by 2030 as per written in the National Strategy for Leprosy Elimination, 2021-2025 [2]. Further Integrating Leprosy control with other endemics communicable diases such as Tuberculosis, Malaria, HIV/AIDS, Dengue and NTDS diseases in the Municipality levels and primary care facilities including Integrated Community Health Care ( SISCa) in the community level and Saude na Familia (family health) in household level are recommended [13,14,15]. **Health Services Delays** : WHO (2016) Global Leprosy Strategy 2016–2020 Accelerating towards a leprosy-free world has recommended for countries that "Leprosy interventions should unmistakably focus on addressing the question of how to enhance efforts in the high-burden countries so that cases are detected without any delay" [16]. In this study we found delay for making decision to seek leprosy services (delay-1) and delay in reaching health facilities (delay-2) were associated with the recent increase of Leprosy Cases. These findings similar findings from recent external study which found the difficulties for patients living in remote areas accessing Leprosy services [2]. Time of patients delays in receiving diagnostic have been documented from other settings. Libardo and his colleagues in Colombia found the mean for delay in the diagnosis of leprosy was 33.5 months [17]. In their study, Mary Henry and his colleagues (2016) found participants who suspected they had leprosy but feared community isolation were 10 times more likely to wait longer before consulting a doctor for their symptoms [12]. They observed that many patients were ignorant to the early symptoms of leprosy, and that the negative image surrounding leprosy within communities contribute to delays seeking treatment due to the fear of being isolated [12]. Thirumugam Muthuvel and his colleagues (2017) observed in their study that patient delay is larger than health care provider delay. They found that many patients were ignorant of early symptoms of leprosy, coupled with limited community activities, and misdiagnosis appears to be contributing to overall delay in diagnosis in areas of Maharashtra, India [18]. **Stigma:** The high social stigma, prevention of disabilities, and the relationship between leprosy and poverty are still major concerns for eliminating Leprosy [19]. Leprosy was connected with the clearly visible and stigmatizing manifestations of the disease, including facies leprosa and changes in the area of palms, as well as the legs [10]. This study found high scores of stigma and discrimination for Leprosy patients from health care workers, communities, and family members. Leprosy patients received less supported from government organizations, civil societies organizations, communities and families. These findings similar to issues of stigma of Leprosy patients encountered were also documented from various researches [12,7,20]. According to Grzybowski and his colleagues (2016) Contemporary leprosy is treatable, but there are cases of stigmatization and discrimination also in developed countries. Even today, people affected by this disease have to leave their villages and are socially isolated [10]. It is important for Timor Leste to implement strategic pillar to combat stigma and guaratntee human right oulined in the Global Leprosy Strategy 2021–2030 to achieve Zero Leprosy Prevalence by 2030 [20,2]. Enhance patient Education on leprosy symptoms; the reduction of stigma to encourage patients to present to the clinics; and increase clinician knowledge in diagnostic and treatment will assist in early diagnostic and treatment. The existing active case detection (ACD) activity need to be strengthening to screen communities identified in this study and other high burden places [2]. The ACD through contact tracing and community screening will help identify earlier Leprosy cases and its close contact in order to commences Multi drugs therapy (MDT) and Chemoprophylactive

prevention therapy [3]. Glennie, M and his colleagues (2021) in their article argue that contact tracing and community screening of marginalized ethnic groups produced the highest new cases detection rates. However, rapid community screening campaigns, and those using less experienced screening personnel , were associated with lower suspect confirmation rates [21].

## 5. Study Limitations

Typically, this type of study is prone to biases. We detected some questionnaires and interview biases occurred during conducting the study. Therefore, the results need to interpret with cautious and these findings will apply to the four municipalities included in this study. The next research shall focus on bacteriological screening with random sampling method in order to determine the actual leprosy cases.

## 6. Conclusion

The study was conducted from September 1 to December 31, 2021, enrolled 403 participants from 4 municipalities reported high prevalence of Leprosy Cases. About 68.5% of participants interviewed reported Leprosy cases, being male, mostly affected productive ages group, and with unknown income. Three health system components of stewardship, ICT, and Services Delivery were found to be associated with the resurgence of Leprosy cases. Delaying in making decision in accessing Leprosy care were associated with o the increased of Leprosy cases in the community. Leprosy patients experience high level of stigma and received less family and community support. Strengthening the active case finding with bacteriological confirmation by trained health professional; early commencing Rifampicin Preventive Therapy for close contacts; and engaging family and community in health promotion on Leprosy; are important recommendations derived from this study .

## 7. Disclaimer

None.

## 8. Conflict of interests

The authors declared that our team are not have conflict of interest.

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