IDENTIFICATION *OF MYCOBACTERIUM LEPRAE* IN HOUSEHOLD CONTACTS OF LEPROSY PATIENTS IN BONE BOLANGO DISTRICT

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ABSTRACT

The purpose of this study was to identify the presence of *Mycobacterium leprae* and determine the bacterial index (IB) and morphological index (IM) in household contacts of leprosy patients in Bone Bolango Regency. The research method used a descriptive approach with data collection methods through observation, interviews, and laboratory examinations. Samples were taken from household contacts of leprosy patients in two sub-districts with the highest number of new leprosy cases, namely Bone Raya District and Tapa District. The examination was carried out in the laboratory of Toto Kabila Hospital. The results of the study showed that of the five samples studied, one sample showed positive results with a bacterial index (IB) of +3, which means that there were 1-10 acid-fast bacteria (AFB) in one field of view. The morphological index (IM) of the positive sample was 50%. These results indicate the transmission of *M. leprae* among household contacts of leprosy patients. Conclusion : There is One case positive of the five samples tested . The samples own index bacteria (IB) +3, which indicates the presence of 1-10 BTA germs in One roomy view . On the index morphological (IM) found by 50%. Findings This emphasize importance routine check and detection early For prevent distribution disease leprosy.

Keywords: *Mycobacterium leprae,* Leprosy, Household Contact .

INTRODUCTION

Mycobacterium leprae is member family *Mycobacteriacae* and the order *Actinomycetalis*. Gerhard A. Hansen discovered bacteria this in 1872. *M. leprae,* as bacteria intracellular obligate, can withhold phagocytosis Because wall its strong and resistant cells to lysosomes [1]. Bacteria that cause disease leprosy, also known as Hansen's disease.

Organism obligatory intracellular *M. leprae* cause leprosy, infection chronic granulomatous. Bacteria This first time login to respiratory tract, then enter to skin, mucosa, muscles, bones, eyes, and testes. one of disease continuing contagious endanger health throughout the world, including in Indonesia [2].

The World Health Organization (WHO) on January 27, 2023 stated that disease leprosy found in 120 countries. There are 200,000 new cases of leprosy reported each year. The top three countries with the highest leprosy cases in the world are India, Brazil, and Indonesia.

In an article published in the "Indonesian Ministry of Health (KemenkesRI)" on the website (http://p2p.kemkes.go.id). With the number of cases ranging from 12,612, Indonesia remains the third largest contributor of new leprosy cases in the world, according to data from the Indonesian Ministry of Health in 2022. 14,376 new leprosy cases were reported in 38 provinces in 2023 [3].

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Less than 1 in 10,000 people in Indonesia suffer from leprosy. Indonesia also hopes to eliminate leprosy by 2024. However, out of 38 provinces, six have yet to reach the prevalence target of 1 leprosy sufferer per 10,000 people. These provinces are North Sulawesi, Maluku, North Maluku, Papua, West Papua, and Gorontalo [3].

In 2022, there were 150 new cases of leprosy in Gorontalo Province, with 90 male cases and 60 female cases. This figure is higher than the previous year, where there were only 135 cases in 2021, with 92 cases for males and 43 cases for females. The NCDR (New Case Detection Rate) figure is 13.5 cases per 100,000 population [4].

Based on data from the Bone Bolango Health Service in 2021 there were 6 cases new sufferer leprosy, and in 2022 there were 25 cases recorded new, and in 2023, 22 cases were recorded new leprosy spread across 20 sub-districts in Bone Bolango Regency.

According to Akbar's research (2020), there is a number of factor associated risks with disease leprosy, including history contact, density housing, and cleanliness personal. Bacteria leprosy spread through channel breathing, especially skin and mucosa nose. Bacteria enter to skin through gland sweat and follicles hair, which has significant impact to development leprosy. At the same time, the density residence reduce consumption oxygen, which makes disease infectious like leprosy more easy spread from One member to member family others. In most case, one patient can spread his illness to two or three other people living in the house them. Cleanliness personal hygiene includes behavior certain, such as share place sleep, wash hair, replace sheet in a way regular, clean floor home, sleep with others, and use towels and clothes in a way regular [5].

According to study Mutmainna (2023), from 40 samples contact same house sufferer leprosy, 7 positive BTA and 33 negative BTA [6]. However results Akbar's research (2020) shows that from respondents who have history contact, 22 (73.3%) showed leprosy, and 2 (6.7%) showed leprosy and considered as group control. This shows that more Lots Respondent with history contact suffer leprosy than respondents who did not. The results of the statistical test (OR = 38.5; 95% CI, 7.415–199.8 p = 0.000) showed that There is 38.5 times more likely big for respondents who have ever own contact with sufferer leprosy For suffer disease leprosy [5].

The bacteria that causes disease leprosy, also known as Hansen's disease. Here classification and taxonomy :

- Domain : *Bacteria*
- Phylum : *Actinobacteria*
- Class : *Actinobacteria*
- Order : *Corynebacteriales*
- Family : *Mycobacteriaceae*
- Genus : *Mycobacterium*
- Spesies : *Mycobacterium leprae*

Disease leprosy consequence bacteria *Mycobacterium leprae*, causes granulomas and lesions infection others. *Mycobacterium leprae* is a resistant bacillus obligate acid (BTA) intracellular that attacks nerve peripheral, skin, and other organs such as liver, marrow bone, mucosa channel breath part above, and nerves center only. Acid-fast bacteria (AFB) and cells are the habitat of this rod-shaped germ, this bacteria has a length of between 1 and 8 microns and a width of between 0.2 and 0.5 microns. This bacteria usually grows in groups, but sometimes spreads one by one [6].

Mycobacterium leprae life for two to three week. *Mycobacterium leprae* can live in the body man for 9 days, then to split in

time eleven day up to twenty One days, and incubation period usually two to five years, even Can more from 5 years. During the incubation period finished, signs disease leprosy like spots white and red on the skin, tingling in some areas of the body, and difficulty will function normally appear. Bacteria can enter through injured skin or droplets [8].

Amount bacteria *Mycobacterium leprae* which is more big make patient No always show significant symptoms ; because pathogenicity and power low invasion from bacteria said , perhaps on the contrary occurs. Leprosy bacillus can enter to in body man through nasal mucosa or skin. Basil will endure in condition dry for two days and even ten day in condition moist [7].

Based on results from a number of study disclose that track the most common transmission is through scratches on the mucosa nose and cold body areas. *Mycobacterium leprae* is parasite obligatory intracellular which is usually found in cells macrophages in the dermis or cell swan in network nerves. If *Mycobacterium leprae* enter to in body, body will emit macrophages, which are potential cells dangerous. Growth target *Mycobacterium leprae* is Schwann cells. Almost No There is cell schwan who did demyelination or phagocytosis. Therefore that, germs or bacteria can migrate and activate If system immunity body damage Schwann cells that cause damage more nerves severe and activity regeneration reduced nerves [9].

Renaldi et al. (2020), stated that although many leprosy classifications have been made for various purposes, the Ridley-Jopling and World Health Organization (WHO) classifications are the most common.

1) World Health Organization (WHO) classification

   WHO divides leprosy into two categories, namely Multibacillary (MB) which has many bacteria, while Passibacillary (PB) has few or no bacteria [11].

2) Ridley-Jopling Classification

   According to Ridley and Jopling, the five categories consist of clinical, bacteriological, histopathological, and immunological characteristics of leprosy [11]. The following is the classification:

   a) TT: Polar tuberculoid with form stable
   b) BT shows borderline tuberculosis
   c) BB shows Middle borderline
   d) BL indicates borderline lepromatous,
   e) LL indicates stable polar borderline lepromatous.

According to Rosa (2019), household contact with people infected with *Mycobacterium leprae* , which causes leprosy, can increase the risk of disease transmission. However, the actual risk depends on many factors, such as the level of exposure and individual immunity [10].

The incidence of leprosy in individuals who have household contacts is almost ten times higher than in individuals who do not have household contacts. Leprosy sufferers in the same household are more likely to transmit the disease to others, such as children who live in the same house with parents who have leprosy have a greater potential to interact with leprosy sufferers than children who do not have parents who have leprosy themselves. A person can get leprosy from another person if they interact once or several times over a long period of time [10].

According to Renaldi et al. (2020), leprosy reaction is an acute condition that can occur at any time when someone suffers from a long-term disease. Although the pathophysiology of leprosy is not yet known, the immunological theory can explain leprosy reactions. Disease leprosy classified become reaction type 1 and type 2, each of which is accompanied by explanation as following [11]:

1) Reversal reaction or first reaction type

   Only patients with borderline lepromatous spectrum or BL, middle borderline or BB, or borderline tuberculoid or BT can experience a reversal reaction because the borderline spectrum is unstable and easily changed. The cellular immune response increases SIS rapidly, which plays an important role in the reversal reaction. This causes leprosy to change into tuberculoid. Although the factors of this reaction have not been studied precisely, this reaction is thought to be a delayed type with a hypersensitivity reaction [11].

   In the first six months of Multi Drug Therapy (MDT) treatment, reactions usually appear. Reversal reactions have clinical symptoms in the form of lesions that become more active in part or in whole. Over time, changes in skin lesions become more active so that they can be indicated by the appearance of changes in skin color, edema, or the spread of wider and infiltrative lesions.


Figure 2.2 Type 1 leprosy reaction (Source: Renaldi et al., 2020)

2) Type two reaction

   Leprosy patients who have many bacteria in their bodies, such as the polar Lepromatous (LL) and Borderline lepromatous (BL) types, experience type 2 reactions. Because they show signs of the appearance of nodes on the skin, this reaction is often referred to as an ENL (erythema nodusum leprosum) reaction. The pathogenesis of ENL is influenced by the humoral immune response, unlike the reversal reaction.

   ENL, also known as erythema nodusum leprosum, can occur before, during, or after treatment. However, this reaction usually occurs in the second year of multidrug therapy, also known as MDT. This is due to the fact that during treatment, a large number of *M. leprae* bacteria die, which results in a large number of antigens interacting with antibodies and producing immune complexes. After that, the immune complexes enter the bloodstream and settle in various organs. This causes symptoms such as painful erythematous nodes, which usually appear on the skin of the arms and legs.

   In most cases, these symptoms often disappear within a few days or weeks. New nodules may also appear and old nodules may become purplish. Iridocyclitis, acute neuritis, arthritis, lymphadenitis, orchitis, and acute nephritis are some of the organs that can show clinical symptoms. Erythema nodusum leprosum [11].


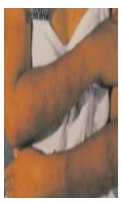

Figure 2.3 Type 2 leprosy reaction (Source: Renaldi et al., 2020)

Many studies have investigated the risk factors that contribute to leprosy deaths

such as a research study conducted by Akbar (2020), found that many variables contribute to leprosy cases, including age, education level, gender, social status, number of families, contact history and duration of contact. Based on previous research by Akbar (2020), found a relationship with several risk factors related to the transmission of leprosy including; Contact History Is a Risk Factor for Leprosy Incidence, Residential Density is a Risk Factor for Leprosy Incidence, Risk Factors for Leprosy Incidence are Personal Hygiene [5] .

Based on leprosy incidents from Miranti's research (2020), it states that leprosy transmission can occur when the *Mycobacterium leprae* bacteria enter the human body, in several ways such as transmission through contact, transmission through inhalation, transmission through ingestion or the digestive tract, transmission through insect bites [12].

Signs and Symptoms; The mucous membranes, nerves, and skin, which are the soft, moist areas inside the body's openings, are the main causes of the signs and symptoms of leprosy [14].

Since 1995, the World Health Organization (WHO) has recommended treatment leprosy with Multi Drug Therapy (MDT) for Pausibacillary (PB) and Multibacillary (MB). MDT drugs can drunk by people who have adults and for children aged ten until four twelve year in tablet form [12].

Leprosy can be prevented through efforts that can be implemented for individuals, families, and communities with the aim of preventing individuals in healthy body conditions who are very vulnerable to the transmission of germs. Therefore, efforts that can be made are promotive and preventive by inhibiting agents (causes of a disease and risk factors). Controlling the environment and changing how hosts can own pattern healthy and clean life [11].

In addition. efforts can be made done as form Community prevention, namely reduce contact directly good for people who suffer leprosy and power health , contact direct Can can done with implement and comply Standard Operational Procedure (SOP) with use of PPE such as masks, gloves For guard position speak 45 degrees , and keep condition good physical is a number of example procedure procedure standard (SOP) [11].

According to Mellaratna (2022), there is three symptom main disease leprosy : Spots on the skin tasteless : Numbness of the skin can in the form of spots colored reddish erythematous as well as spots white or hypopigmentation . Thickening nerve edge : Interference nerves caused by inflammation nerve long - standing edge known as peripheral neuritis . This can cause pain and difficulty do function the affected nerve.

Bacteria stand acid is also known as positive BTA, found : results positive BTA examination usually show lesions on active skin areas and skin smears lobe ear .

Inspection clinical disease leprosy There is a number of method namely anamnesis, examination physical, bacterioscopic, histopathological, serological.

RESEARCH METHODS

In the study study use approach qualitative with type study Descriptive. Research procedures qualitative collect descriptive data that includes statement written or words participants and visible behavior Can observed. This study used For do identification *Mycobacterium leprae* on contact same house patient leprosy in the Bone Bolango Regency area. The research This done during eight twelve day, which is

where sample taken in Bone Raya District and Tapa District, Bone Bolango Regency. Then carried out inspection samples at Toto Kabila Regional General Hospital. Data collection was carried out by means of observation, interviews, documentation and laboratory examinations. The results of the data that have been collected are then processed.

RESEARCH RESULT

Table 4.1 shows the results in tabulation :

No	Kode Sampel Kontak	Umur (tahun)	JK	Hub. Keluarga	Alamat	Hasil Pemerilcsaan BTA	Kesimpulan
1.	BR/HD/WL.01	26	P	Istri	Ds. Inomata	-	Negatif
2.	BR/WI/PVI.02	24	L	Kakak	Ds. Pelita Jaya	-	Negatif
3.	BR/NI/MH.03	33	L	Suami	Ds. Pelita Jaya	-	Negatif
4.	TA/YB/FB.04	22	L	Kakak	Ds. Talulobutu	+3	Positif 3
5.	TA/SZ/DA.05	62	L	Suami	Ds. Talulobutu	-	Negatif

Bone Raya and Tapa Districts became the subjects of research in the laboratory of Toto Kabila Hospital, Bone Bolango Regency. A total of five samples were obtained, with three in Bone Raya District and two in Tapa District.

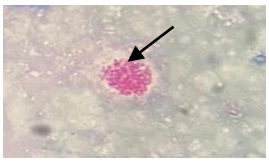

Figure 4.1. Non-solid form of *Mycobacterium leprae* stained and examined at PKM Tapa, Bone Bolango Regency.
(Source : Primary Research Data , 2024).

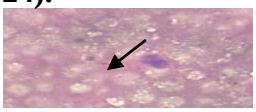

Figure 4.2. Solid form of *Mycobacterium leprae* stained and examined at Toto Kabila Regional Hospital, Bone Bolango Regency.
(Source : Primary Research Data , 2024).

After researched, it turns out from 5 samples there is 1 sample positive Reitz serum / (+) contains resistant bacilli acid (BTA) namely sample with TA/YB/FB.04 code . Obtained results with index bacteria (IB) +3 because there are 1 to 10 resistant bacilli acid (BTA) in 1 LP. For index morphological (IM) of 50%, which was obtained from the formula as following :

$$\frac{\text{Jumlah solid}}{\text{Jumlah solid + nonsolid}} \times 100\%$$

$$\frac{8}{8+12} \times 100\%$$

$$\frac{8}{16} \times 100\%$$

$$0{,}5 \times 100\% = 50\%$$

DISCUSSION OF RESEARCH RESULTS

Research process in a way overall in progress for 18 (eight) years twelve) days, which began since June 5, 2024 to June 23, 2024. Samples are in the form of serum taken from contact same house sufferer leprosy cases registered in 2019 and 2020 which are still get treatment at the Bone Raya Health Center and the Tapa Health Center in Bone Bolango Regency. After researched, obtained results that of the 6 patients recorded, the number member family (sample) of 28 people and those with symptoms as well as willing For taken sample as many as 5 people for Then researched.

Study started with interview in-depth, which involves question about history health a person, the symptoms that may be experienced, and relationships with sufferer leprosy in life everyday. Before do taking sample, respondents requested For fill in letter informed consent consent) as proof willingness For participate in research. In addition, it was carried out observation For

evaluate condition health respondents and identify possible symptoms relate with leprosy.

Furthermore researcher do inspection laboratory, start from preparation instruments and materials to be used used. After that, Reitz serum samples were taken from lobe ear left and right respondents who indicated at least One symptom leprosy. Cuping ear is Frequent locations found *Mycobacterium leprae* reason disease leprosy, because bacteria This tend choose location with a slightly warm temperature more low compared to body area others, so that lobe ear become the right place For taking sample.

After the retrieval process sample, steps furthermore is do coloring or painting use method Ziehl Neelsen. Coloring This aiming For identify bacteria stand acid which is generally related with disease leprosy, sample Then examined under a microscope For reading and calculation results.

Research result show that Of the 5 samples, there was 1 sample (+)/ positive in the examination microscopic with painting Ziehl Neelsen with index bacteriological (+3) because there are 1 to 10 resistant bacilli acid (BTA) in 1 LP.

After to obtain index bacteriological (IB), steps next is evaluate index morphology (IM) which aims For determine presentation from form leprosy with count presentation solid forms and compare them with total percentage amount of solid and non-solid. In the calculation index morphology (IM), obtained results by 50%.

For ensure the presence of *M. leprae* bacilli in the incision ear leprosy patients, examination microscopic carried out. In the examination Microscopically, *M. leprae* bacillus is stained red found, shows that BTA is positive. Because wall *M. leprae* cells have high lipid (fat) content, so coloring Ziehl Neelsen chosen Because coloring normal No can penetrate wall *M. leprae* cells. Reaction between carbolic fuchsin with *M. leprae* cells produce color red that appears. Layer wax and fat of *M. leprae* cells, so color still endure after washed with sour alcohol 3% color This No fade after washing with sour 3% alcohol with adding methylene blue will make background behind colored blue that can make it easier *M. leprae* observations become more clear below microscope [13].

There is 1 sample with results positive originate from one of contact same house patient leprosy, according to researcher caused by the presence of risk factors transmission disease leprosy That itself, especially by factors history contact, duration of contact, and intensity contact with patient leprosy that makes it easier transmission bacteria *Mycobacterium leprae* from patient to his closest people like contact house. The theory outlined by Siswanto et al. (2020), supports results This that history contact covers all form connection somebody with sufferer, good same house and no. Transmission leprosy caused by leprosy intact sufferers, people who live together sufferer leprosy own potential four times more tall For suffer disease mentioned [14].

In addition, prolonged contact between patient leprosy can also transmit his illness to member his family. People who are close with sufferer in a way physical, such as through contact skin and breathing (speaking), have possibility more big For infected disease leprosy. Infection heavy can caused by dose high exposure or duration contact with more sufferers of two years. This is depends on power stand body man Because There is individual with Power stand low body or high, the result disease can appear after germs leprosy enter

in body humans. People who are close with source transmission leprosy own possibility more big For caught infection leprosy [14].

The above theory is also supported by the statement of Menaldy et al. (2020), stating that the history of contact, duration, and intensity of contact between leprosy patients and their household or household contacts can make it easy for the bacteria that cause this disease to enter other people's bodies, because the interaction between patients and their family members makes it easier for germs to have more potential to enter new hosts through the respiratory tract, namely the nasal mucosa and skin, then *Mycobacterium leprae* enters the body and moves towards the surface of the skin, the hair follicle channels and sweat glands [15].

After entering the human body, it will experience an incubation period that can last for several weeks, depending on the case of leprosy. There are reports that the highest incubation time is thirty years. Most people agree that the average incubation time for leprosy is three to five years. A person can be infected with the *Mycobacterium leprae* germ if they interact with leprosy sufferers for a long time and have a long incubation period. As a result, the person can also get leprosy [12].

This is in line with the results of previous research conducted by Mutmainah et al. (2020), from a total of 40 samples examined, 7 samples showed positive BTA, while 33 samples showed negative BTA. The results of the examination of the first stage of acid-resistant bacilli in leprosy patients at home showed negative results of 82.5%, 1+ 15%, and 2+ 2.5%.

In addition, in the study of Yohana et al. (2017), found a correlation between contact history and leprosy cases in Kenjeran District, Semampir District, and Tandes District, with a p value of 0.003 below 0.05. This shows a correlation between contact history and leprosy incidence with OR 5.278 (CI 95%: 1.687–16.514). People who have had sexual intercourse with leprosy sufferers have a 5.278 times higher risk than people who have not.

CLOSING

Conclusion

Based on results research and discussion, then can concluded that from fifth samples that have been researched, the results show there is One sample positive (+) with Index bacteria (IB) +3, which indicates the presence of 1-10 BTA germs in One roomy view. In addition, to calculation index morphological (IM) obtained by 50%.

Suggestion

1. Recommended to Health Centers and Health Services in Bone Bolango Regency specifically officer laboratories and leprosy program holders to be active in do inspection For prevent transmission disease leprosy with give education and detection early about contact same house sufferer leprosy.
2. Recommended For researcher Which will come :
   a. Do study more deep to inspection contact with neighbors and colleagues Work patient leprosy, remembering possibility transmission leprosy No only limited to contact same house.
   b. Do study advanced about inspection contact housemates, neighbors, and colleagues Work patient leprosy with use method others, for example inspection serology.

REFERENCES

[1] Ahmad, A. (2020). Overview of Airborne Transmission of *Mycobacterium leprae Through Identification of Leprosy Carriers*

Using Nasal Swab PCR Examination in Populations with a History of Close Contact with Leprosy Patients: (Doctoral dissertation, Hasanuddin University).

[2] Amiruddin, Prof. Dr. Muh. Dali, dr. Sp. KK (K). (2019). Leprosy: A Clinical Approach, Makassar: Hasanudin University Makassar Press.

[3] Ministry of Health of the Republic of Indonesia. (2023). 2023 Performance Report of the Directorate of Prevention and Control of Infectious Diseases. Jakarta.

[4] Gorontalo Provincial Health Office. (2022). 2022 Health Profile of Gorontalo Province.

[5] Akbar, H. (2020). Risk Factors for Leprosy Incidence in the Juntinyuat Health Center Work Area. Wiyata Journal: Science and Health Research, 7(1), 37-47.

[6] Mutmainna, M., Mursalim, M., Nasir, M., and Hadijah, S. (2020). Early Detection *of Mycobacterium leprae* in Household Contacts of Leprosy Patients After Undergoing Treatment. Journal of Health Media Analysis, 11(2), 112-118.

[7] Lestari and Puput. (2020). Literature Study: Family Nursing Care for Leprosy Patients with Nursing Problems of Knowledge Deficiency. Muhammadiyah University of Ponorogo.

[8] Nur Amalia, A., Sudarsih, S., and Merbawani, R. (2022). Community Stigma of Leprosy Sufferers (Doctoral dissertation, Bina Sehat University Library).

[9] Cendaki, QA (2018). Findings of the Presence of *Mycobacterium leprae DNA* in the Air as an Indication of Leprosy Transmission Through the Respiratory Tract. Journal of Environmental Health, 10(2), 181-190.

[10] Hidayat, A. (2018). Prevalence of Leprosy Patients with Disabilities at the Langkat District Health Office in 2014-2016.

[11] Renaldi et al. (2020). National Guidelines for Medical Services for Leprosy Management in Indonesia. Jakarta.

[12] Miranti, DI (2020). The Relationship Between the Use of Personal Protective Equipment (PPE) and Skin Integrity Disorders and Psychological Impacts on Health Workers at Husada Utama Hospital, Surabaya (Doctoral dissertation, S1 Nursing).

[13] Mellaratna, WP (2022). Early Diagnosis of Leprosy to Prevent the Disabilities Caused. Lentera: Scientific Journal of Science, Technology, Economy, Social, and Culture, 6(2), 58-62.

[14] Siswanto, Tanti Asrianti and Dwi Mulyana. (2020). Neglected Tropical Disease Leprosy Applied Epidemiology. Mulawarman University Press. Samarinda.

[15] Menaldi, et al. (2020). National Guidelines for Medical Services for Leprosy Management. Director General of Health Services. Ministry of Health of the Republic of Indonesia. Jakarta.

[16] Saragih, BP (2024). Description of the Degree of Depression in Former Leprosy Patients at Lau Simomo Kabanjahe Leprosy Hospital.

[17] Mellaratna, WP (2022). Early Diagnosis of Leprosy to Prevent the Disabilities Caused. Lentera : Journal Scientific, Technology , Economic, Social , and Cultural Studies , 6(2), 58-62