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THE STUDY ON HEALTH IMPACT OF SUTETI AMONG COMMUNITY LIVING UNDER SUTETI TOWERS, 2007

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ABSTRACT

Background and Method: A study on the health impact of the Extra High Voltage Transmission power line, 500 kV (SUTETI) was carried out among 1750 people who have been living for more than 15 years around the tower in Jakarta and Tambun. The dependent variables were health impact based on identification of laboratory exams on blood chemistry, electrocardiogram, adult roentgen photo, bone photo roentgen of children, hypertension as well as mental emotional disorders using Cornell Medical Index (CMI) and Sleeping Disorders. The melatonin enzyme was measured trying to identify the association with electromagnetic field exposure and mental psychosomatics evidence. The independent or risk factors measured besides the socio demographic, duration of stay, length of stay at home, smoking were the respondents' annoyance and satisfaction living around the tower and the reasons of feeling not safe. At the same time the electromagnetic field was also measured separately. The personal electric and magnetic field doses were the function of length of stay inside the house and the electric field and magnetic field measured inside the house. The study location was divided into three zones, zone 1, 0-30 ms left and right sides from center of tower foot, zone 2, 30-70 ms and zone 3, 70-100 ms. **Results and Conclusion**: Study results reported the range of electric field measured , at one meter from the ground, showed the highest 3,2 kV/m just underneath the tower (10-30 m), declined to 0,5 kV/m about 70 m away from the center of the tower and steadily declined, about 70-100 m, the electric field became very small to 0,0 kV/m The magnetic field measured were, the highest 20-30 m, 534 mA/m (6,7x 10 -² mT), declined at the distance of 70 m to 110 mA/m (1,3 x 10 -² mT), very small at a 100 m, 50 mA/m (6,3 x 10 -3 mT). Study results also revealed that there were no significant associations identified between adults roentgen results, children bone roentgen results, hypertension, mental emotional disorders/ CMI, sleeping disorders with electric and magnetic field dose . The logistic regression functions reported the magnetic field dose as a borderline determinant to electrocardiogram. People who lived 0-70 m had 7 times greater risk to suffer from emotional mental disorders than those living >70 m away from the tower even though mental emotional disorders was neither significant to electro field dose nor to magnetic field dose. The melatonin correlates positively with electromagnetic doses which mean melatonin was not suppressed by the electromagnetic exposures. Melatonin also neither associated with CMI nor with sleeping disorders.

Keywords: Extra High Voltage Power Line Transmission (SUTETI), lab exams on blood chemistry, electrocardiogram /ECG, roentgen, bone roentgen in children, CMI, Sleeping disorders, melatonin, electric field dose, magnetic field dose

INTRODUCTION

The Extra High Voltage Power Line Transmission, 500 kV/m known as SUTETI or *Saluran Udara Ekstra Tegangan Tinggi* in Indonesia has been used for electrical energy transmission from the Power Generating Resources to the Electrical Relay Stations and then distributed to the public. At the moment the community needs for electrical energy supply is in high demand. *Perusahaan Listrik Negara* (PLN) has planned in the coming years to increase the electrical energy supply by establishing 10.000 MW which will be transmitted through SUTETI and in many locations will pass through public residence areas especially in big cities. One of the major concerns that arose is the public complaints about health impacts of the electromagnetic exposure due to SUTETI.

Globally, a lot of animal, cell and epidemiological studies were carried out until recent to identify the health impact of power line, SUTETI or the group of Extremely Low Frequency (ELF) 50-60 Hz in human. Nancy Wertheimer, 1979, USA was the first epidemiologist to report the existence of strong association beween child cancer and very high current configuration which has turned world attention to electromagnetic health impact.[1] Prestigious personal researchers and research centers were participating in those studies such as IARC[2] which in 2002 reported that magnetic fields were classified as possibly carcinogenic to human and was adopted by the World Health Organization (WHO), 2002. WHO, to address this problem has established the Electromagnetic Field Program (EMF), 1973

collaborating with NIEHS USA , UNEP, ILO, International Non Ionizing Radiation Committee (INIRC/International Radiation Protection Agency/ IRPA, International Commission on Non Ionizing Radiation Protection /ICNIRP, Avisory Group on Non Ionizing Radiation (AGNIR) of the Health Protection Agency (HPA) United Kingdom, Institute of Environmental Medicine Karolinska Institute Stockholm, Sweden, Institute of Cancer Denmark, National Institute of Environmental Studies Tsukuba, Japan, RAMS of Occupational Health, Moscow, Health Council The Haque Netherlands, Nationale Institute of Health, Italy, Univ.of Stellenbosch Capetown, Swinburne University of Technology Melbourne, Australia, School of Medicine, Hangzhou, China Univ.[3]

The huge bulk of global study results on power line health impacts are still 'inconsistent', to prove the causality relation between power line electromagnetic field and human disorders.[3] WHO EHC 238, 2007 on cancer still comply to the IARC, 2002 released statement classification on power line exposure to human.[2,3]

In Indonesia several epidemiological studies have been carried out, Wawolumaya & Muchtaruddin[4] reported no potential health impact factors were identified among acommunity who lived at least 5 years below SUTETI towers and in the vicinity.[5] Another occupational study reported by Panggabean there were no significant relationships between place of work and mental emotional disturbance among the electric generating power station workers.

This study tries to identify the potential local health impact and the risk factors of SUTETI among communities which have been living for 15 years or longer underneath SUTETI towers. The study tries also to provide local information on power line health impact in Indonesia as a contribution to the nation. The location of study was Tambun and East Jakarta, Subdistrict of Kebon Pala.

METHODOLOGY

The design of study was epidemiological analytic cross sectional. Subjects were recruited from communities living beneath 19 SUTETI towers in Tambun and three towers in Kampung Makasar, East Jakarta. The subjects were recruited proportionally sampled, while the sampling location were divided in three zones, zone 1, 0-30 m left and right hand side from the center of the tower line, zone 2, left and right side 30 -70m from the tower line, and zone 3, > 70 m - 100 m away from the center tower line.

The sampling frame was developed by the health group and the technical group, the latter was responsible to measure the electrical and magnetic field inside the house, the house yards and the vicinity of houses.

The number of subjects recruited about 2000 while the calculated minimal sample size was 751 subjects. The health impact variables being measured were electrocardiogram (ECG) , adults chest roentgen, children bone roentgen, hypertension, mental emotional disorders, sleeping disorders, physical examination, blood chemistry while the independent or risk factors measured were melatonin, annoyance and satisfaction feeling as well as sociodemographic, socioeconomic, length of stay at home in one day, duration of stay at the location, smoking besides the electric field dose and magnetic field dose. The latter two variables were the functions of electric field and magnetic field measured inside the house while the lamps were on and personal length of stay at home (these variables were created to allow magnetic and electric field be analyzed statistically in the model).

RESULTS AND DISCUSSIONS

Study results reported on the electric field measurement one meter high from the ground, the highest was in zone 1, 20-30 m from the center tower line 3,2 kV/m; zone 2, distance of 70 m declined to 0,5 kV/m and persistently declined closely to 0,0 kV/m at zone 3, distance between 70-100 m. The magnetic field measurement one meter high from the ground, the highest zone 1, 20-30 m, 534 mA/m (6,7 x 10^{-2} mT) declining at zone 2, 70 m, 110 mA/m (1,3 x 10^{-2} mT), very small at zone 3 until 100 m closely to 50 mA/m (6,3 x 10 -3 mT).

The electric field measured in this study as mentioned somewhere built a skewed to the right curve with the highest 3,2 kV/m in the first 20-30 m, declining to 0,5 kV/m and nearly zero at the distance of 70 m. These data showed that the highest is still less than the threshold value adopted 5 kV/m, based on *Standar Nasional Indonesia* (SNI) , 2003.[6] The magnetic field also showed a similar trend the highest 0-20 m 0,067 mT lesser at 30- 70m, 0,013 mT and nearly zero at 100m 0,006 mT. The measured

magnetic field values also showed that the highest 0,067 mT is less than the threshold value 0, 1 mT. These results also showed that the electric and magnetic field are still in lower levels according to WHO, 2007 which will result in no disorders or hazardous effect in human.[3,6] Another fact shown that the closer the location from the tower the bigger the electromagnetic field. Djoko[7], 1996 who conducted measurements using the same equipment, in Tambun, the same location of study only reported the highest electric field 0-30 m from the center of power line, 2,7 kV/m, magnetic field 1,49 mG (1,49 x 10-4 mT), Both were lower than the results of 2006 and the figures were below the ICNIRP, WHO, SNI 2003.[6] Both study findings were still below the national standard, nevertheless it should be taken into consideration the discrepancy between the data in 1996 and data of 2006. This raises the recommendation for PLN to monitor the electromagnetic field below the tower regularly, especially the distance 0- 70 m left and right hand the central of tower line. Considering the biological and adverse effects of SUTETI or ELF 50-60 on human health the spectrum electromagnetic wave reported that the ELF, non ionizing group does not produce any harmful effects in human body such as thermal, optical hazards or broken bonds inside the cells.[8]

The electromagnetic wave spectrum consists of groups with wavelengths and frequencies , starting from the longest waves until the very small, Ultraviolet (UV), Visible Light, Infrared (IR), Microwaves (MW, Radiofrequency (RF), Low frequency (LF), Very Low Frequency (VLF) and Extremely Low Frequency (ELF) (Figure 1). The smaller the wavelength the smaller impact on human. United Nations Environmental Programme (UNEP), WHO and IRPA, 1987 issued several statements on the biological effects occurred due to electromagnetic current exposure of 50/60 Hz in the whole body of human as follows : 9 1-10 mA/m² no significant bio effect ; 10-100 mA/m², bio effects exist mostly eyes and nerves.; 100 - 1000 mA/m² , stimulating the health disturbance toward the sensitive organ - chronic health disturbance ; above 1000 mA/m² causing extra sistole, ventricular vibration and heart disturbance, acute health disturbance.

Based on the UNEP classification above, the health standard was being accommodated. The standard for electric field 5kV/m, may induce the effective current less than 4mA/m² for the whole body, the magnetic flux 0,5 mT will induce effective current 1mA/m².

This was adopted by WHO 1992 and International Radiation Protection Agency /IRPA for Guidelines Protection[9]: Guidelines for limiting exposure to time varying electromagnetic fields (up to 300 Hz) . The health impact of ELF in body organs occurred from environmental exposure and electromagnetic body exposure. The environmental exposure is very small unless special exposures exist such as SUTETI etc.

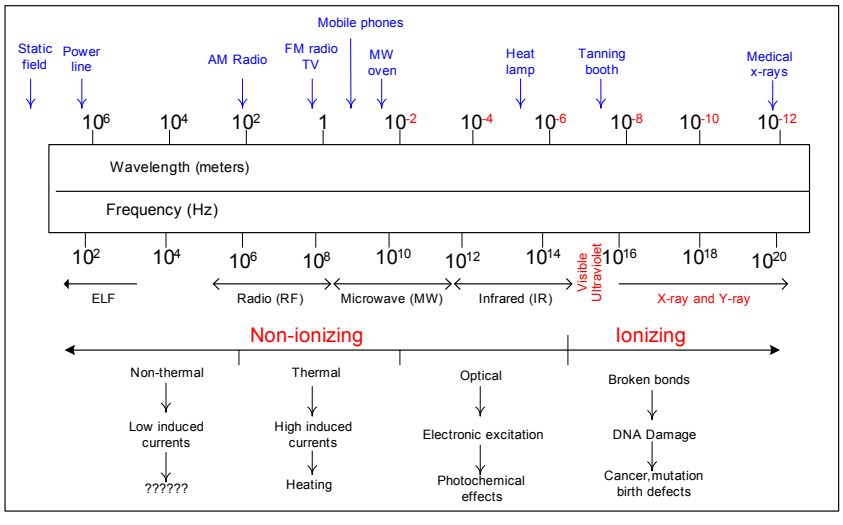


Figure 1: The Electromagnetic wave Spectrum
Source : Moulder8

Indonesia has already adopted the National Standard based on the recommendation of IRPA and WHO 1992.

National Standard in Indonesia for ELF Power line 50-60 Hz (SNI No 04 - 6950 - 2003)7

Exposed to	ElectricField kV/m (rms)	Magnetic Field Flux mT (rms)*	
Workers			- time of
- whole day of work	10	0.5	exposure in field
- short Duration	30	5	between 10-30 kV/m use the formula t<80/E t = time duration , hr/ one working day , E = electric field kV/m
- body extremities	-	25	
Public			
- 24 hr/day	5	0.1	- maximal
- several hr/day	10	1	time of exposure

* T = Tesla
Source : SNI - Standar Nasional Indonesia SUTT and SUTET Badan Standardisasi Nasional (BSN) ,2003

Statistical Analyses

The analytical statistical method used is the logistic regression function. The results of logistic regression function analyses were as follows:

1. ECG (Electrocardiogram)

The ECG results reported normal 82,2% of the whole sample and no significant difference among zones, meaning the prevalence was similar in zone 1,2 and 3. Zone 3 is considered similar to the normal population. There is no difference between the high exposed location/ zones 1 and 2 and the normal population on the prevalence of ECG. The logistic regression function test was as follows: Variables: age, education, income, duration of stay at the location, smoking, satisfaction, annoyance, hypertension, status of nutrition, cholesterol, exercise, CMI, SD, melatonin, electric field dose*, magnetic field dose* and zone.

(Electric field dose * = home electric field measured x length of stay at home in one day for each person)

(Magnetic field dose*= home magnetic field measured x length of stay at home in one day for each person)

CMI - Cornell Medical Index; SD - Sleeping Disorders

Bivariate: (variables p< 0,25); hypertension p 0.001; sex p 0.008, magnetic field dose p 0,014; smoking p 0,016, electric field dose p 0,054, income p 0,058, zone p 0,104, duration of stay p 0,113, education p, 0142, state of nutrition p 0,216, exercise p 0,273. The logistic regression function results with R square 0,1310 (model fitting), determinants factors identified were : hypertension p = 0,031 OR 2,263 (CI 95% 1,078 - 4,752); sex p 0,019, OR 0,459 (CI 95%, 0,240 - 0,881), magnetic field dose p = 0,032 OR 1,80 (CI 95% 1,052 - 3,092), income p 0,044 OR 3,55 (CI 95% 1,037 - 1, 192). Hypertension, sex, magnetic field dose, income and sex were determinants of ECG. Subjects with high magnetic dose will have the risk 1,80 times to have abnormal electrocardiogram compared to low magnetic dose. Since magnetic dose is equal to length of stay at home times magnetic field measured inside the house, this finding should take into consideration the amount of magnetic field at home resulted from electrical house equipments and the electrical wire network inside the house. A study should be performed to investigate this. There were several cases of arrhythmia identified. Several studies on long term effects of ELF exposure to heart diseases like Graham et al.[10] Sastre[11] and Tabor et al.[12] failed to explain the relation between arrhythmia and infarction many years after long term occupational exposure to ELF field. Silny[13] reported that with exposure 5Hz - 1kHz, magnetic field < 100 mT resulted no change in ECG. The study magnetic field measured was less than 0,1 mT, also the Odd Ratio is still very small less than 2,00, the CI is actually not significant, concluded that this finding even though mediocre should be remembered in the precautionary measures in the field.

2. Chest Disorders (Adults Rontgen Photos)

The adult roentgen photos reported normal 95,1%, no significant difference among zones identified. The logistic regression function was as follows: The variables analyzed were age, sex, education, income, smoking, duration of stay,

satisfaction, annoyance, hypertension, melatonin, electric field dose, magnetic field dose, zone, state of nutrition, CMI, and SD. The bivariate analyses identified variables p > 25% were hypertension p 0,033, length of stay p 0,059, melatonin p =0,069, magnetic field dose p 0,075, zone p 0,078 and nutritional status p = 0,160. Logistic regression function R square 0,402, identified the only determinant was hypertension p = 0,033 OR 8,2 (CI 95% 1,182 - 56 ,941). Groups with hypertension will have the chance to have chest disorders about 8 times compared to group with normal hypertension. No relation exists between electric and magnetic field dose with chest disorders.

3. Children Bone Growth Disturbance (Rontgen Photos)

The bone roentgen among children was identifying the possibility of bone growth disturbance, reported normal 83,0% and no significant difference among zones identified. The logistic regression functions were as follows: Variables in the model, age, sex, parent's satisfaction, annoyance, nutrition status, melatonin, electric field dose, magnetic field dose, and zone. With p < 0,25, parents satisfaction p =0,150 and magnetic field dose p = 0,214. Logistic Regression function, R square 0,024, no determinant to children growth disturbance identified.

4. Hypertension

The normal proportion of hypertension was 68.8%. It is about similar to hypertension in the urban areas in Jakarta especially among workers. The logistic regression function was as follows variables in the model, age, sex, education, income, smoking, satisfaction, duration of stay, annoyance, cholesterol, melatonin, electric field dose, magnetic field dose, nutritional status, CMI, SD. Bivariate variables were cholesterol p 0,031 magnetic field dose p 0,005 nutrition p 0,000. Logistic regression function, R square 0,483, model fitting p = 0,000, the determinants were duration of stay p 0,004 OR 3,850 (CI 95% 1,039-14,122), income p 0,019 OR 15, 891 (CI 1,578-159,973). People who live >30 years underneath the tower were at 3,8 times more risk, compared to living < 30 years, of suffering hypertension while low income were being risky 15 x compared to medium income group suffering hypertension. No relationship was identified between electric and magnetic field dose towards hypertension.

5. Mental emotional disorders (Cornell Medical Index)

The mental emotional disorders proportions were significantly different among zones. Abnormal CMI were identified in zone 1, 20,41%, zone 2, 13,61% and zone 3, 8,59%. The closer to the tower the bigger the proportion. This information was backed up by the logistic function regression results as follows: the variables were age, sex, education, income, smoking, and satisfaction, duration of stay, annoyance, hypertension, melatonin, electric field dose, magnetic field dose, zone, and status of nutrition. The bivariate variables were. Sex p 0,253, low income p 0185, high income p 0,173 smoking p 0,005, magnetic field dose 0,039, zone 0,000, nutr state 0,208. Logistic regression function R square 0,253, p 0,058 identified the determinants as; zone p 0,024 OR 7,355 (CI 95% 1,297 - 41,711). People living in zone 1 and 2 (0-70 m) were at 7 times more risk to suffer mental disorders compared to people live in zone 3 (> 70 m). No relationship was identified between electric field and magnetic field dose as well as melatonin with mental emotional disorders. The subjective symptoms of mental emotional disorders by many authors called as hypersensitivity have been popular being mentioned as related to ELF/power line exposures. The wide range of severe and debilitating symptoms including sleeping disturbances, general fatigue, difficulty in concentrating , dizziness and eyestrain , skin problems such as exzema, sensations if itching as being reported by Silny[14], ICNIRP[15] and Rubin et al.[16] This was addressed by WHO in Praque3 when it was concluded that symptoms were associated with diverse environmental factors tolerated by majority of people should betermed 'idiopathic environmental intolerance with attribution to electro magnetic field. Several symptoms were also reported in this study especially in zone 1 and 2 , 0-70 m from the tower proven not related to electric and magnetic doses, as well as smoking. These subjective symptoms assumingly could relate to feeling of annoyance. The main reason of annoyance reported were frightening caused by experiences of flaming/burning electric test pens, noise of corona , impaired electrical sound system and TVs in mosques and houses due to electrical technical faults. The other popular reason of annoyance is the fear of tower collapse. The flaming of electric test pen and impairment of electrical equipment at home and mosques could

be corrected through proper electrical grounding of houses and buildings. The noise of corona is very disturbing when it is raining.

7. Sleeping Disorders (SD)

The proportion of normal Sleeping disorders without insomia 49,64%, no significant difference among zones. The logistic regression functions were as follows: The variables were age, sex, education, income, satisfaction, and annoyance, duration of stay, hypertension, and state of nutrition, zone, melatonin, electric field dose and magnetic field dose. Bivariate; age p 0,172, satisfaction p 0,125, melatonin p 0,149 magnetic field dose p = 0,040, state of nutrition p 0,003. Logistic regression results p 0,031 R square 0,041 identified determinants as; nutritional status p 0,012 OR 0,584 (CI 0,385 - 0,886). Subject with normal status and below normal were protective for Sleeping Disorders. Akerstedt, et al.[17] an experiment using EEG test to sleeping reported no change observed, far from clinical significance, While Graham and Cook, 1999[18] reported that intermittent but not continuous exposure to 60 Hz 28 μT at night resulted in less total sleep, reduced sleep efficiency decreased rapid eye movement. This study also reported the magnetic field less than 6 μT with the electric field of 50-60 Hz .The relationship between melatonin and sleeping disorders was not significant; there is no reason to relate sleeping disorders with brain impairment.

Melatonin

There was a positive correlation r = 0,22 (p 0,001) between electric field dose (zone 1 and 2) while zone 3 (> 70 m , r 0,15 (p 0,002). Total r = 0,168 (p 0,000). For magnetic field dose, with zone 1,2 r 0,185 (p 0,006), zone 3, r 0,179 (p 0,000) total r = 0,165 (p 0,000).The findings showed that there are positive correlation between melatonin concentration and electromagnetic field doses. The positive correlations proved that melatonin was not suppressed by the electromagnetic doses. This is also in accordance with AGNIR, 2001b[19], ICNIRP.[20]

As a whole the study reported that the electric fields as well as the magnetic field at home and in the vicinity are below the threshold values in SNI, 2003, meaning there is no health impact due to SUTETI exposure in the location. Nevertheless the magnetic field some was bigger than 0,3 - 0,4 μT which is considered in some areas could resulting an elevating of childhood leukemia. Kabuto et al,[21] 2006 in Japan conducted study on Acute lymphocytic leukemia (ALL) and Acute myeloid leukemia (AML) among 20,0 million children aged 0-15 years. The final analysis, when compared with children who were exposed to magnetic fields < 0, 1 μT, OR for exposure 0,4 μT 2,63 (95% CI 0,77 - 8,96) for all leukemia combined. No elevation in risk was observed below 0,4 μT.The risk was higher for ALL OR 4,73 (CI 95% 1,14-19,7), with no risk increased for AML.[21] Draper et al.[22] 2005, 33,000 children from birth to aged 14 years with cancer diagnoses in England, Scotland and Wales were identified for types of cancers. A distance - dependent excess risk was observed for leukemia, ranging from RR 1,36 for distance to line 500-599m to RR 1,67 for distance of 0-49m, compared to distance greater than 600 m. Both studies could not improve the IARC classification of magnetic field since according to WHO Kabuto's study was impaired by the uncertainty due to small sample size, the low response rate was the limitation of study. The Draper limitation of study was selection bias and distance is a very poor predictor of magnetic field exposure.

In the study the magnetic field dose was repeatedly reported as factors considered in the bivariate regression only in ECD it was the borderline determinant. Those findings should not be ignored but always be highly considered. This is also in accordance with WHO Protective Measures, 2007 in country Health Policy, Precautionary Principle in ELF Policies.[3] The recommendations are, good communication, mitigation/changes of planning new facilities/ engineering changes of existing facilities, reguler monitoring of electric and magnetic field of ELF /Power line field in home and surrounding.[3]

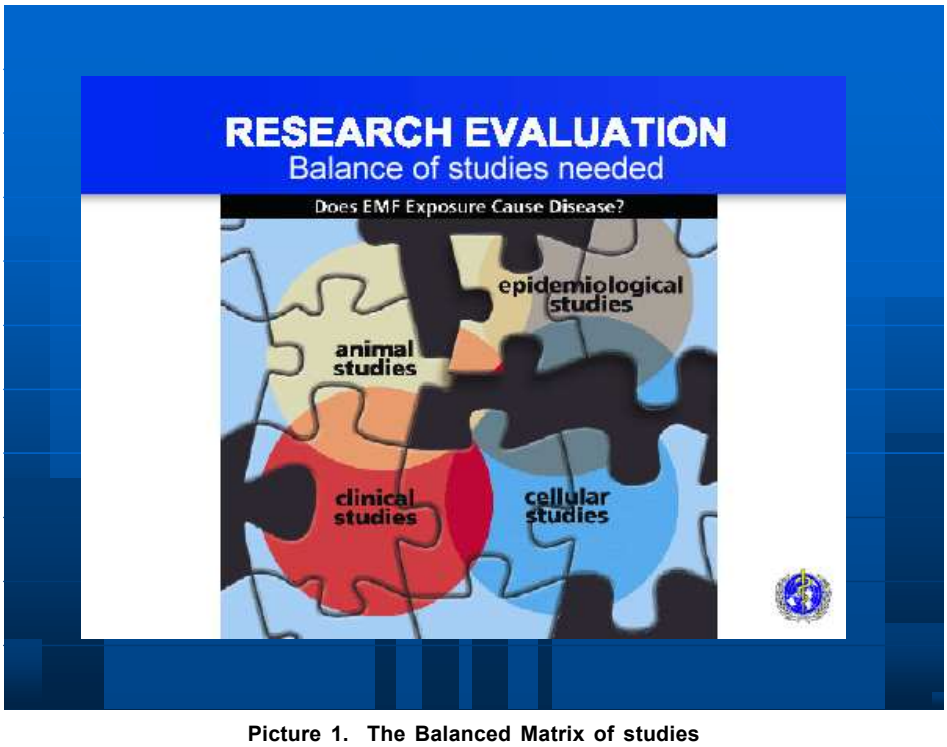
Based on the logistic function analyses results there are several main results that should be taken into consideration. First, the magnetic field dose as a determinant of the electrocardiogram. Even though the OR 1,8 (CI 95% 1.052 - 3.092) is at the borderline too small to be considered as being the important determinant. This finding should be studied in depth since the electromagnetic effects of domestic equipment as well as home electrical wireless are not yet excluded. A study of the electromagnetic field for domestic equipment and domestic wire network should be carried out among households in Indonesia. Another thing to be considered is the magnetic field dose is a function of length of stay at

home and the magnetic field at home. As a matter of fact the magnetic field at home identified was 0,13 mT, a little bit higher from the threshold value 0,1 mT. This is to strengthen the recommendation to the government/PLN in conducting the Precautionary Action in the field.

Another considerable finding is the mental emotional disorders, the psychosomatic evidence; people living in zone 1 and 2 were about 7 times risky to get mentally disturbed compared to zone 3. The logistic regressions neither show the relation of zone towards electric field dose nor the magnetic field dose as well as annoyance and satisfaction. It was assumed that the mental emotional disorders which was about 30% presumably not so far from normal population was affected by some other reasons such as bad experiences due to electrical technical faulties .This is also should be corrected by Policy of PLN through Precautionary Action.

The important aspect to be considered is to answer the question whether power line field does produce a direct health impact on humans which cannot be analyzed from this study has been thoroughly directed by the way how WHO works, illustrated in ' The Balanced Matrix of studies 'Figure 2.[23] Looking at the picture below of how WHO tries to balance the different types of research works results on power line field i.e., animal experiments, cellular, epidemiological and clinical studies, one will understand that the effort was very comprehensive. Positive, negative and ambiguous study results on power line field studies related to human all over the world were reanalyzed without banning even one positive study results to identify the causality relation. WHO considers the direct impact as the causality relation?

WHO EHC 238,[3] reported that the causality relation is still cannot be established. WHO has already released the comprehensive results of studies in Environmental Health Criteria (EHC) 2007 included Human Health Risk Assessment, 2006 and the Precautionary Approaches for global consumption. WHO has also released the Fact Sheet no 322 on Electromagnetic fields and Public Health in June 2007.[24]



Picture 1. The Balanced Matrix of studies
Source: Repacholi, WHO 23

This methodology has been conducted by WHO through the International Electromagnetic Field Project (EMF) since 1973 in collaboration with different World Commissions i.e. International Agency for Research on Cancer (IARC), International Commission on Non Ionizing Radiation Protection (ICNIRP), Advisory Group on Non- ionizing Radiation (AGNIR) of the Health Protection Agency (HPA), NIEHS, and experts from many countries USA, Great Britain, Australia, Sweden etc. as mentioned above.3 In this collaboration WHO carried out at recent many workshops i.e. Neurodegenerative Disorders Workshop Geneva, 2002, WHO Cardiovascular Disorders, Stockholm, Sweden, 2003, WHO Childhood Leukemia NIES Japan September 2003, WHO Protective Measures for ELF EMS workshop, NIEHS USA, Febr. 2005, Task Group on ELF electric and magnetic fields Geneva, October, 2005 before in 2007 released the Environmental Health Criteria (EHC) 238 dealing with Health Impact of Power line Electromagnetic exposure.[3]

WHO Task Group update, June 2007 concluded that there are no substantive health issues related to electric field at levels generally encountered by members of the public. Magnetic field short term effects, at very high field strengths (above 100 μT) can cause nerve and muscle stimulation in nerve cell excitability in the central nerve system. For potential long term effect the Task Group does not alter the classification, issued by IARC, 2002, which were based on the scientific evidence of animal experiments and epidemiological studies. The IARC under the auspices of WHO, and the ICNIRP in 2003 issued the same statement saying that the magnetic field of power line field is categorized as possibly carcinogenic to human (category of 2B).This is based on pooled analyses of epidemiological studies demonstrating a consistent pattern of two fold increase in childhood leukemia associated with average exposure to residential power - frequency of magnet field above 0,3 to 0,4 μT. The IARC grouping of cancer agents are based on limited epidemiological evidence plus limited or inadequate animal evidence. The other substances categorized as 2B were having regularly 'drinking coffee' or being exposed to 'gasoline engine exhaust'.[3]

As a matter of fact WHO until now has concluded that the scientific evidence related to childhood leukemia is not strong enough to be causal. Also for other childhood cancers, cancers in adults, depression, suicide, cardiovascular disorders, reproductive dysfunction, development disorders, immunological modification, neurobehavioral effects and neurogenerative disease, the WHO Task Group concluded that these health effects are much weaker than for childhood leukemia. The other statements for cardiovascular disease and breast cancer were that the evidence suggest that magnetic field do not cause these conditions.[22] WHO EHC 238 has already issued the Precautionary Policies should be adopted by countries.[3]

These are several main pointers from WHO, 2006 in the Precautionary Approaches which are very strongly related to the study findings:

1. Policy makers should establish ELF Protection Programmed that includes measurements of fields from all sources to ensure that exposure limits are not exceeded either for the general public or workers
2. Changes to engineering practice to reduce ELF exposure from equipment or devices should be considered, provided that they yield other additional benefits such as greater safety, or involve little or no cost.
3. Local authorities should enforce wiring regulations to reduce unintentional ground currents when building new or rewiring existing facilities, while maintaining safety. Proactive measures to identify violations or existing problems in wiring would be expensive and unlikely to be justified.

CONCLUSIONS

Study results reported the electromagnetic field was the strongest underneath the tower getting smaller further from the tower, at about 100 m close to zero, the highest still below the SNI exposure limits. No health impact will happen due to low electric and magnetic field measured.

Based on the electric and magnetic field measured in house, all below the national standard, no health impact of SUTETI among people in the location expected. Study results identified no indirect health impact of electric and magnetic field dose in humans i.e. chest disorders, bone growth of children, hypertension, mental emotional disorders and sleeping disorders, except the borderline magnetic field dose for ECG. Melatonin was not suppressed

by electromagnetic field. Melatonin is neither a determinant nor a risk factor for mental emotional disorders and sleeping disorders. There was another finding which was not correlated to the electric field dose and magnetic field dose but should be considered in the Precautionary Action: People living underneath in the tower, or located 0-70m away from the tower may suffer more from mental emotional disorders compared to living >70 m.

Any direct health impact on humans was not possible identify in this study, it is the WHO Task. The causality relationship still cannot be established. The results of studies are still inconsistent due insufficient, limited and inadequacy of studies, reported by WHO Environmental Health Criteria on Electromagnetic Exposure on Human Health 238, 2007. Nevertheless WHO has already issued the results of Human Health Risk Assessment and the Precautionary Policies on EMF for global use.

RECOMMENDATIONS

It is strongly suggested to monitor regularly the magnetic field underneath the tower especially the distance 0-70 m away from the central of tower. A study on the electromagnetic field of domestic appliances, electrical wireless network inside the houses/buildings should be carried out especially in the urban residence area. An epidemiological study on infant health is recommended among population underneath the tower. An intervention study on how to handle the mental emotional disorders among community living underneath the towers should be conducted.

A program of correcting Electricity Technical faulties in local houses/buildings underneath SUTETI should be carried out. A proper electrical Grounding for housing to avoid electric shock, burning test pens, damage of domestic electrical appliances such as sound system , TVs, radio etc. A proper technology should develop and implemented to reduce the noise of corona.

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