extensive background information on exposures, mortality for exposed and unexposed people could be compared on a variety of topics.

The researchers of the Thai cohort were often asked whom the cohort represents. In the International Journal of Epidemiology, a luminary such as Ken Rothman wrote a paper saying that it was a mistake for a cohort to represent the host population. However, the Thai cohort has approximately the same sex ratio as the Thai population, and a bit more urbanized. This meant that the Thai cohort was ahead of the curve in the transition. The cohort also has 95% Buddhists, over represents Bangkok a bit, and socioeconomically represents normal Thais. The cohorts were university students who are trying through education to uplift themselves up socioeconomically.

Professor Sleigh then showed some interesting examples of the information emerging out of the cohort analysis. The first example was with respect to height. Group height carried with it information about group's childhood health. If the group had frequent infections and limited food, they would not grow tall. However, the males in the cohort have progressively increased their height. Those who were born in the 1940s were quite short, just 167 centimeters, while those who were born most recently in the 1980s were quite tall, 172 centimeters, and there was a growing gap between the rural and the urban population. This meant the rural people had grown taller and had benefited from the socioeconomic improvement in Thailand in the last 50-year period, but the urban people had benefited more.

Looking at the association between income, obesity, and BMI between two comparable age groups, for females there was a falling risk of obesity and BMI as income increased, and for males it was an increasing risk of obesity as income increased. The norm was as the developing country population gets richer, the richer people was expected to become more obese. However, at about $2500 income females were able to control obesity and turn their look around. This was similar to the western pattern where high socioeconomic class females were thin, and low socioeconomic class females were not so thin. It meant the Thai cohort had already adopted a western pattern. Professor Sleigh also showed graphically that a little bit of incidental exercise protected against obesity for both males and females.

Prospective associations have been analyzed for the 4-year data. It showed a strong association between BMI and cancer, even within a 4-year follow-up. This was because the large size of the cohort was good in getting effects to appear quickly. Cardiovascular disease was also strongly associated with BMI, which was expected and reassuring. Diabetes was also strongly associated and was a rapidly growing problem in Thailand.

With regard to measuring hypertension, Professor Sleigh explained that hypertension was validated by having a physician telephone interview a sample of people reporting hypertension, and the outcome of the process was satisfactory. The longitudinal analysis from 2005 to 2009 was done for finding risk factors for hypertension in the Thai population. Hypertension was a higher risk when going from overweight to obese, with an Odds Ratio of 4.14, and also a higher risk for diabetes.

Another big phenomenon being investigated intensively was injury. Injuries at baseline affected 21% of the population in the previous year. This was injury defined as serious enough to require medical attention. The highest percentage was for road injury, since the traffic situation in Thailand was dangerous. However, injury at work, agricultural work and nonagricultural work, and gym was being investigated, and already around 5-6 papers had been published on the topic. An interesting association regarding transport injury was that it was more frequently experienced by males. Male at age less than 20 was a risk factor for transport injury. Lower income people had a higher risk of transport injury, maybe since they were more exposed to motorcycles. Similarly, urban dwellers and current drinkers were also more at risk. Those who admitted to poor eyesight also were at higher risk of transport injury. Surprisingly, those who had a father who died in an accident were at risk for transport injury themselves, as well as those with high level of social interaction and others with low life satisfaction.

Regarding mortality, the top causes of death in the cohort are injuries, cancers, heart disease, cerebrovascular disease, HIV, and pneumonia. However, some of the pneumonia could also be HIV.

People were not asked specifically about HIV, but it was possible for them to mark a box saying other infections.

In conclusion, Professor Sleigh showed some of the risk factors for cardiovascular disease mortality. He stated that being married was heart protective, as well as being female. Additionally, being a current smoker also has strong relationship with cardiovascular disease as well as being diabetic, being hypertensive, and having ischemic heart disease.

Professor Sleigh also informed the audience that they had produced a special document as a resource for the faculties. The document contained a three-volume printout of all the papers produced with annotation and description in the reference. Additionally, an electronic version of the same was also presented.

Lecture 3: Thai Cohort Study

NCD Interventions in Thailand: Surveillance and Prevention Goals and Strategies

Sam-ang Seubsman

Talking about the health system in Thailand, Associate Professor Sam-ang noted that Thailand followed WHO goals quite obediently. Although there were WHO guidelines for everything, Thailand had its own way of dealing with those guidelines.

The non-communicable disease targets for the Thai cohort were divided into three groups. For mortality and morbidity, the WHO's target was to reduce it by 25%, while Thailand had a target of 12%. For diabetes, Thailand followed the same target as the WHO, which was not to increase. For hypertension, the WHO had a target of 25% reduction, whereas Thailand had about 12%. For alcohol also, the target was to reduce its intake, but it was difficult for Thai men to reduce alcohol intake, so the Thai target was a reduction by 5%. Physical activity was difficult to measure, so it was measured using the MoPH guidelines, which meant being physically active three times a week for 30 minutes each time. Also, Thai food being strong in taste, it was difficult for Thai people to reduce salt intake. For strengthening healthcare management for people with NCD, Thailand also followed WHO guidelines which were prominent, and Thailand had a PP, health promotion and disease prevention model.

In the PP model the MoPH has five target groups, but NCD prevention is focused on the working group. Their basic services include screening for diabetes and hypertension, and also screening for cervical and breast cancers. The Thai National Program would be discussed in detail by Dr. Mek. However, in the area of health promotion there was communicable disease control, food safety system, and community and environmental health.

Ms. Sam-ang explained that she was focusing on the intervention guide rule, and stated that Thailand had nearly a million health volunteers all over the country. One volunteer may look out for five households, and in one village there was about 9-10 volunteers. If these volunteers were responsible for diabetes, they would get the training from a health personnel on how to do a blood test, and then receive the toolkits to take the blood test. For hypertension, every center in every village had electronic blood pressure machines into which people inserted their hand, and then pressed the button. The villagers were quite happy to have that test. This was very effective in getting people aware of the problem, because everybody perceived hypertension as a silent killer whereby one day people just drop dead or got paralyzed.

Ms. Sam-ang then explained a case study from the Rae Tambon Health Promoting Hospital. They set up a specific services index and targeted Thai people 15 years old and above. They were then screened for diabetes and hypertension through a behavioral risk factor surveillance system, which also included

questions related to alcohol, smoking, drug abuse, energy drink intake, traffic accident risk, polypharmacy intake, mental illness, risky diet involving half cooked food, salty, or sweet food, and physical exercise.

The basic surveillance for DM included measurements for BMI with a waist circumference greater than 90 centimeters for males, and greater than 80 centimeters for females. Also, questions were asked about direct relatives who had DM, acanthosis nigricans, or hypertension greater than 140/90, and about pregnancy history. Monitoring was done every 3 months by the Tambon NCD Board at district level, provincial level, and health service network level.

After this basic screening, those at high risk for DM were referred to a doctor, and all the data were kept in the provincial central hospital, the general hospital, the community hospital, or the Tambon Health Promoting Hospital. They also observed new cases each year. Also, the target for the DM/HT specific services is that 100% of the DM and HT complications should be cared for as well as the peripheral vascular system.

The DM/HT risk cases were evaluated for heart disease, stroke, depression, stress, and alcohol disorder using the Rama EGAT Heart Score, the stroke risk evaluation form, the screening form for depression, and the screening form for alcoholic disorder.

Questions and Answers

Question #1
Professor Wang asked that since the presentation showed transportation injury as the number one reason for deaths and Thai was being famous for the auto bikes, whether these auto bikes were the main reason for injury.

Professor Sleigh agreed that motorcycle injuries were the major component of the road transport injury problem. However, he remarked that the good news was that motorcycle transition was also taking place in Thailand along with health transition, demographic transition, epidemiologic transition, and health risk transition. Motorcycle registration peaked in 2005, and since then has been falling every year.

Question #2
Professor Wang also asked what 'ill-defined' meant in the presentation.

Professor Sleigh replied that 'ill-defined' was a problem in all developing countries in vital statistics registration. Ill-defined was a death classification where the manner of death was not clear. Until recently, 40-50% of the mortality was ill-defined making it difficult to study mortality trends in a cohort study. However, for the Thai cohort study the Ministry of Public Health contacted the family members and the hospitals, and clarified the reason for death. In this manner, the 'ill-defined' deaths got down to much lower levels. Meanwhile, Thailand had been improving its death recording.

Professor Wang felt that such terms made the data difficult to compare with other countries. Professor Sleigh agreed to this fact. He added that every country needed to know its own health risk interactions better. He stated they were providing some of those data for the Thai government, but it was difficult to compare one region to another, because the categorizing was not logical. It was a different way of presenting the information.

Professor Hu added that one of the major causes of death was injury because cohorts were young men. Professor Sleigh agreed that the age of the cohort at the time of generating the cohort in 2005 was 15-87. At the last follow-up, it was 23 to 92. He stated that most of the cohorts at risk are at age 20 to 40, but there were around 5000-6000 people older than that.

Question #3
Mr. Hashimoto had a question about the DM screening for 35 years and up. The DM screening for them composed of waist measurement and fasting capillary blood glucose test. He wanted to know if glucose test was done or not from the beginning.

Ms. Sam-ang Seubsman replied that at the beginning the trained health volunteers measure the waist circumference and the BMI, and fill out a questionnaire for health risk, but only high risk persons get to a doctor at the health center and have fasting blood test. Hence, initially the health volunteers did a physical measurement and a very simple finger prick blood test, and divided the population into normal, pre-diabetic, and diabetic groups.

Question #4
Professor Wang wanted an explanation about the high social interaction as a risk factor for transport injuries. Additionally, he wanted to know if home injury meant domestic violence or some other thing.

Professor Sleigh replied that home injury could mean domestic violence. The female population reported more injury in home than transport or sporting injuries. They could be talking about the gendered nature of life in Thailand, where females are exposed to more home injuries and males to road traffic injuries, and that was expressed in the statistics.

Regarding the social interaction, Professor Sleigh stated they were more interested in social capital as an upstream driver of health transition itself. Hence, there were many questions relating to the importance of social interaction in people's lives, and those variables were then used to derive social interaction markers and test them in the model. It's a social capital as well as a happiness marker. The research found a strong relationship between happiness and not dying.

Also, replying to whether all the questionnaires were combined into one, Professor Sleigh stated it was too complicated to explain. Therefore, they had given out printouts and annotations that could be consulted for methods and rationale. Also, the content would be helpful in dealing with the questions relating to social capital and mortality, and happiness and mortality.

Question #5
Dr. Md Khalequz Zaman was interested in knowing about the motivating factor for people participating in the cohort study, because he had really struggled to get the questionnaires from his cohort.

Ms. Sam-ang Seubsman replied that one driving force could be that the cohorts were university students. However, they had followed consensus regulation very strongly. It meant that the letter written to the students clearly said that their answer would not affect their education performance at all. However, the letter gave reasons how answering the questionnaire could help the community. Hence, the letter gave them the benefit to themselves as well as the benefit to the community and to the nation, since Thailand had a nationalistic society.

Another driving force was public relation. Ms. Sam-ang engaged in everything through which they could reach their cohorts such as newspapers, newsletters, university media, television media, SMS, et cetera. They also made a dynamic logo for the cohort study, a healthy cartoon including a boomerang as the Australian collaborative symbol. It also had a poem. The cartoon was made into a mascot with the words 'fight for it' printed below. Professor Arian also got the idea that since 20 pages of questionnaire would be tiresome, he made a progress bar so the students could see how much near to the finishing line they were. Hence, Ms. Sam-ang stated that they tried all different methods to encourage the cohort to actively participate in the study.

Professor Sleigh added that they opened their project office on the 9th day of the 9th month at 9 minutes past 9, to which Ms. Sam-ang stated that 9 was a lucky number for Thai people representing progress.

Lecture 4: NCD and Prevention in Thailand

Seven Wonders of the (NCD) World

Dr. Thaksaphon (Mek) Thamarangsi

Introducing himself, Dr. Mek stated that he was basically a policy researcher, and that his presentation talked about the seven wonders in NCD prevention and control, and that it was general and not specific to Thailand.

The first wonder was titled "most burdensome, but not important". NCD was the global number one killer, and close to 80% of deaths were occurring in low income countries. Focusing on all profiles of burden of disease, years of life lost, and DALYs, the 10 greatest risk factors were all NCD related. Dr. Mek opined that the health system of a country was to deal with these challenges, otherwise the country did not need a health system.

Looking at the global profile in 2010, the big four diseases were cardiovascular disease, cancer, diabetes, and chronic lung disease, covering more than 50% of global deaths. Likewise, the big four physiologic changes were hypertension, hyperglycemia, dyslipidemia, and high BMI. Similarly, the big four risk behaviors were tobacco, alcohol, unhealthy diet, and inadequate physical activity. This model was also called the 4 x 4 x 4 model.

In Thailand, 73% of deaths were from NCD. This was equivalent to the thrice of the combination of deaths from infectious disease, maternal and child disease, under nutrition, traffic accidents, and injury. Each risk factor changes, and behavior changes killed more than 10,000 Thais a year. Tobacco killed 50,000 a year and, surprisingly, DALY from NCD is close to three-quarter, 73%. This meant that NCD killed in a large scale and at young age, because DALY comes from premature deaths.

Dr. Mek argued that the best way to track commitment given to something was to track the budget allocated to it. First, looking at the global health scale, which was the money spent beyond one's country, there has been an increased budget for global health. However, he felt comparatively it was peanut money to fight the number one killer in the world. As for the country level expenditure, it was difficult to identify the budget for NCD. However, P&P, prevention and health promotion, could be used to trace the NCD budget. The country level expenditure suggested that higher income countries spent more on P&P. In this regard, Canada was the world leader, Tajikistan, Myanmar, and Djibouti had the lowest spend on P&P, while Thailand was just on the line. However, changing the P&P as a percentage budget out of the total health expenditure showed that high income countries had less percentage of P&P, but spent more on treatment because NCDs had high treatment costs. In this regard, Thailand was a little bit above the average line at 8-9%.

In the last 20 years, Thailand had increased its budget for P&P four times from around 10,000 million baht to around 40,000 million baht, but looking at the percentage of the total health expenditure it was much the same, 8-9%. It meant that the budget for health was increased, but more money was going for treatment, not for prevention, which was the same elsewhere in the world. New players like the Universal Health Congress, the health insurance funding, and local governments had become big players for P&P. Everybody says that prevention is more important than cure, but Thailand has kept the P&P percentage at 8-9%.

Dr. Mek then moved on to the second wonder, which was "preventable, but not prevent". NCD was largely preventable by preventing the risks, or by delaying changes and holding the risk of disease. There were other risk factors like genetics and emotion control, but behavioral risks such as tobacco, alcohol, diet, et cetera were the main enemy to deal with. In Thailand also the greatest risk factors for males were the same, alcohol, tobacco, and high blood pressure, and for females were BMI, unsafe sex, and high blood pressure. Dr. Mek stated there will be a study on the burden of disease in 2014, but he guessed that the same factors will emerge.

The changes in trend of almost all the risk factors like mean blood pressure, mean body mass index, and mean cholesterol had continuously increased over the years. However, blood sugar had stabilized a little bit. This change in trend meant that when there was an increase in risk, the disease would also increase and the NCD tsunami could come very soon. Studying the prevalence of overweight and obesity in Thai adults for the last 20 years also showed that it had increased rapidly. This change was interesting in that it had been for the whole society irrespective of the socioeconomic situation. It could be called as a collective movement of risk change. Twenty years ago, only around 15% of the adult Thai female population was overweight and obese, however, at present it's almost half the country. With respect to nutrition status, 20 years ago almost 60% of Thai males were under nutritioned, now it is around 9%. As a result, the whole distribution curve had moved up and moved towards the right as well.

Regarding the hypertension and diabetes status, 60% of Thai adult males were unaware of their hypertension, and among those who knew, 25% did not have access to care. Among those who had access to care, two-thirds could not control it. Hence, overall only 15% could control their hypertension, while the rest 85% males were walking time bombs in the Thai society. This 85% was about 10 million population. The situation with females and on diabetes was only slightly better. The Thai government had not done enough to control these.

Again going back to health expenditure, Thailand's health expenditure in 2011 in prevention and promotion was $850 million a year, which was far less compared to OPD and IPD expenditure. However, one positive thing about Thailand was the Thai Health Promotion Foundation, which was an innovative financing mechanism for health promotion. Around 2% of the excise tax on smoking and drinking go directly to the Health Promotion Foundation, which was around $120 million a year. This money was to control alcohol and tobacco injury. However, overall the budget for alcohol control compared to the market size of alcohol in the Thai market was miniscule, about 500 times difference. For tobacco it was the same with 250 times difference. Ridiculing this Thai Health Promotion Foundation budget which was $1.85 per capita, Dr. Mek stated it was equivalent to buying one fish burger in the market.

The third wonder was that NCD was not only a health problem, it was a socioeconomic development problem, and it cost a lot. In the last 20 years, the societal cost from NCDs globally was $46.7 trillion. In lower middle-income countries per capita cost per year for NCDs was $50, while for upper middle income countries it was $140. Hence, if this crisis was not stopped, then many countries could go bankrupt.

In Thailand, a study showed that the cost of the big four diseases was 2% of GDP, which was very high. Interestingly, people felt that medical care costs had increased, but it had increased by one-quarter only, whereas the indirect productivity loss costs three-quarters. This was when people died young, or were absent from work, or were caring for somebody at home. Therefore, NCD was a problem to the economic system in the long run. This could be seen in the high societal cost of NCD risk factors in Thailand. There was also a complicated linkage between NCD and poverty. NCD could make people poorer through three mechanisms; one was expense on alcohol, tobacco, and other NCD risks. Second was because they had to pay for doctor and healthcare cost. Third and the largest portion was productivity loss, or opportunity cost. They lost opportunity to work if they were not cured.

In Thailand, another study had shown that tobacco and alcohol shortened the productive life span. Smokers lost almost 5 years, while heavy drinkers lost almost 4 years of their life compared to nonsmokers and nondrinkers. It also lessened income by up to $12,000. In Thailand and other countries, poor people who were not foresighted paid more for the harmful product. The poorer paid around 6% of their household expenditure on alcohol, while the richest paid only 3%, and the most worrisome fact was that the trend was going up. As a result, tobacco and alcohol as a risk factor for NCD may have a role in expanding the social inequity.

Dr. Mek listed a few common economic arguments, some of which were put forth by the industry telling the policymakers not to act, and they were effective because policymakers decided on not doing anything.

However, doing nothing would lead to bankruptcy. Policymakers told that increased tax on tobacco, alcohol, salty food, or beverage would hurt the poor man. However, the poor gets hurt the most from the alcohol and tobacco problem, and they were also the most beneficiary group if the economy was controlled.

Dr. Mek's fourth wonder was titled "need orchestra, but solo (in health)". About everyone knows the social determinants of health. Many years ago a person had stated that one had to attack the root cause and keep advocating for health in policy. He also said that the society had to be made easier for people to make healthy choices rather than dealing with each individual. However, in Thailand it was not so. In convenience stores, children will find healthy choices such as milk or tea or juice much more costly than sweetened drinks. To deal with this, one will have to deal with all the determinants of obesity and overweight from individual self-control to trade policies. Unfair trade agreements where unhealthy items were dumped at cheaper rates in poorer countries had to be stopped.

The food norm given in health and educational books were very different to the food norm advertised in the TV, which the kids found more interesting. The kids saw fatty, sugary, and salty foods all over the TV and Facebook, and yet the media was not being controlled.

An interesting case was that the Thai healthy lifestyle strategy had two phases for addressing the big four diseases, big four behaviors, and mental health. The prime minister was the chair of executive board, while on the second level, in the policy board, the health minister was in the chair with over 60 agency committees. However, for the last 8 years these two boards had not had a single meeting. Hence, Dr. Mek feels that the NCD Godzilla was being fought with a toy gun, while others were sitting as audience doing nothing and in fact discouraging people who were trying to do something good for NCDs.

The fifth wonder was titled "know awesome, but choose awful". The WHO had recommended the 'best buys' interventions for population-wide approach, which were cross-effective and practical. These 12 inventions dealt with risks and not disease. Individual care and treatment costs a lot, and was six times more costly than population-wide interventions. Best buy population wide interventions required less, only $0.40 per capita per year in a low income country. Hence, this was the best social investment to tackle NCDs with high returns.

In a study, the top five cost effective interventions shown to tackle obesity were advertising ban, taxation, front package food label traffic light, education to reduce sweet and sugary beverage (SSB), and gastric banding. Unfortunately, these interventions were not popular. Dr. Mek reminded the audience that in Thailand, the health expenditure had increased four times in 20 years, but still, the mortality rate from the big four diseases had not gone down considerably, except for ischemic heart disease. Hence, the limited resources that Thailand had were being spent in an awful way.

Sixty percent of the limited resources were going in expressed demand P&P, which were healthcare oriented activities in healthcare settings like antenatal care, postnatal care, well-baby clinics, and cervical cancer screening. However, none of these addressed risk factors in the real world. This also meant the health system was prioritizing activity and healthcare. Instead of paying for tobacco and alcohol control, people paid for screening for diabetes and hypertension. Hence, the health system was focusing on secondary prevention and not on primary prevention.

The sixth wonder was titled "Need comprehensive tools, but choose single bullet". A few years ago, a leading academic in the UK came up with a diagram to fight childhood obesity. However, looking at the diagram the healthcare people could do very little compared to the whole panoramic landscape. Hence, a comprehensive tool was needed to tackle the NCDs. Many things could be done for alcohol, tobacco, diet, and physical activity such as price control, availability control, advertising control, and marketing. But people preferred to be in the comfort zone of screening, treatment, and health education. Not preventing meant intentionally increasing the risk into disease unnecessarily.

The last wonder was titled "require capacity, but not invest". In the long run, the quality of the system capacity had the final say such as technical capacity, coordination, implementing policy, evaluating policy, advocacy, team work, and so on. An individual cannot do anything, hence a group was needed. However, no one wanted to pay for capacity building. People love outputs and outcomes, but spend less on capacity building in the long run. Additionally, how to invest to build sustainable capacity was also needed to be learned.

In conclusion, Dr. Mek stated that his seven wonders were not about blaming anyone, but these were the challenges and obstacles facing everybody today that needed to be overcome by working together. Otherwise, the NCD crisis will overcome the world.

Questions and Answers

Question #1 & #2
Mami Wakabayashi explained that her research topic was alcohol consumption and non-communicable disease in Thailand. Alcohol is the number one burden of disease in Thailand. Therefore, she asked how to monitor alcohol sale and consumption in order to prevent young adults from drinking.

Mr. Hitomi Hashimoto wanted to know the age group of the Thai adults from 1991 to 2009 shown in page 3 in wonder #2, "preventable, but not prevent".

Dr. Thamarangsi replied that the slide represented Thai adults 15 years old and above, and the slide was from the Thailand national health examination survey. Replying to the alcohol question, Dr. Mek stated that alcohol was the number one risk factor in Thailand with one-third of the alcohol burden of disease coming through injury, because young adults are more prone to road injuries. The other one-third burden comes from mental health problems.

Talking about his thesis experience, Dr. Mek commented that they had sent 18 and 19 year olds dressed as kids to buy one bottle of beer from 400 outlets twice, in daytime and in night time. These kids had a 97% success rate. This meant although it was illegal to sale alcohol to kids, the law was not being enforced. However, he felt that one single shot for solving the teenage alcohol problem was to ban alcohol and advertising completely. Otherwise, it would simply not work. He also said that some tobacco companies smuggle untaxed tobacco in the country themselves when tax on tobacco is raised. As a result, the government hesitates to increase the tobacco price. These companies keep the two-tier market strategy, and there is a lot of evidence for that. Dr. Mek compared NCD to malaria, stating that NCD was not infectious, but was communicable. The mosquito here was the industry.

Question #3
Professor Sam-ang Seubsman wanted to know if Dr. Mek had also encountered the alcohol with herb that poor people in Thailand drank and was available everywhere. She also added that some alcohol message stating that moderate alcohol consumption was good for the heart confused many people, including her.

Dr. Thamarangsi explained that most of the herbal alcohol was also coming from industrial sources, because it was cheaper to buy alcohol and mix them than brewing the alcohol themselves. This was because the labor cost of brewing was going up. Japan and South Korea were the number one and number two drinkers in whole Asia. For Thailand, the official adult per capita consumption record was 7 liters of commercialized alcohol. However, he argued that there were no health benefits from alcohol, because while it may benefit the heart, it was bad for the health and caused breast cancer, colon cancer, and so on from the first drink.

Question #4
One participant stated that Thailand used to be portrayed as having the best practice for tobacco control, but the recent data was not very encouraging. He wanted to know the reason behind it.

Dr. Thamarangsi agreed that Thailand was not a world leader in tobacco control anymore. Tobacco control in Thailand from 1990 to the early 2000s was quite good, when the prevalence rate among men was reduced from 60% to 40%. However, since then Thailand has not been doing anything about tobacco control, and as a result, an increase in early use of tobacco among teenagers have been seen. Kids smoke more, because through free trade agreement, Thailand imports cheap cigarettes from other Asian countries. After signing a deal with China, more of this cheaper variety of cigarettes is coming. The world leaders in tobacco control at the moment are New Zealand, Singapore, and Bhutan. Bhutan is a smoking tobacco-free country, although it has smokeless tobacco. There are big posters in the Ministry of Public Health of a Buddhist monk leader who is very influential to Bhutan society, and this monk said that smoking can harm the present life as well as the next life.

Question #5
Professor Atsuko Aoyama informed Dr. Mek that for this seminar they wanted to invite somebody from the Ministry of Public Health of Thailand, because Thailand has been perceived to have advanced health promotion programs. However, Dr. Mek's presentation was very candid and showcased the struggle that he was going through as a technocrat in the Ministry of Public Health.

Dr. Aoyama stated that one of the major objectives of the seminar was to find a better, feasible policy, which was evidence based, but finding ways to implement the policy and to move people outside the health sector was still a problem. She also remarked that since the Thai government was changing, it may provide some opportunity for the health ministry to promote healthy things.

Dr. Thamarangsi indeed agreed that this changing climate in Thailand was an opportunity to promote health, and good law came during those periods. The second to last military coup got them the tobacco control act, while the last military coup got them the alcohol control act. Therefore, Dr. Mek stated that this time they wanted to achieve two things; first, legislation to ban advertising, and secondly, to improve tobacco control.

Lecture 5: NCD and Prevention in Bangladesh

Current Epidemiology of Cardiovascular Diseases in Bangladesh

Sohel Reza Choudhury

Professor Choudhury began his presentation by stating that he was an epidemiologist and completed his Ph.D. from the Shiga University of Medical Science. He had stayed for 9 years in Shiga, and this changed his views about practicing medicine and about public health.

Professor Choudhury's presentation would focus on the Current Epidemiology of Cardiovascular Diseases in Bangladesh. He would present an overview of cardiovascular diseases in Bangladesh and its risk factors, and data from the National Representative Surveys on tobacco and NCD.

Bangladesh is a small country compressed between India and, with a small boundary, Myanmar (or Burma). It is highly populated with 160 million people in 147 square kilometers, so it is one of the most densely populated countries of the world. Most of the population lives in rural areas, while only 28% lives in urban areas. Recently, life expectancy had increased to 70 years, but was still one of the low income countries by World Bank standard, with a literacy rate at around 50%.

Looking at the disease pattern in Bangladesh, the WHO NCD Country Profile published in 2011 show that 54% of deaths were from non-communicable diseases in Bangladesh. Among this 54%, cardiovascular disease was 27%, while others were cancers, respiratory diseases, et cetera. The cardiovascular disease death rate in Bangladesh compared to other neighboring countries was higher, except for Afghanistan and Pakistan. Same was for the coronary heart disease death rate. It was also high in the South Asian region.

The comparison of age-standardized stroke death rates among various countries of the world published in Global Heart found that compared to other countries, the age-standardized stroke death in Bangladesh was high. Compared to Japan, Bangladesh has four times higher death rate for stroke and five times higher for coronary heart disease, but death rate is lower when compared to neighboring countries like India and Pakistan. However, in comparison to countries like Sri Lanka and Nepal, this death rate was higher.

In 2004, the WHO did a survey which reported that about 2.5% of people have coronary heart disease, and 2% have stroke in Bangladesh among people aged 25 and more. Extrapolating that rate to the 2008 population showed that 1.7 million adults were suffering from coronary heart disease and 1.3 million from stroke. These were huge numbers that had to be dealt by Bangladesh's resource-poor health system. The hospital data also showed that the admission for coronary heart disease and stroke was increasing. About 7.7% are coronary heart disease patients, and 8.9% are stroke patients among hospital admissions.

However, one success story of public health intervention in Bangladesh was the control of rheumatic heart disease and rheumatic fever. In 1988, the National Center for Control of Rheumatic Fever and Rheumatic Heart Disease was established with the help of the Japanese government. This center had a big impact on the reduction of the prevalence of coronary heart disease. Also, later on the economy of the country improved as well as the living and hygienic situations. This project had an intensive health awareness component, along with the training of physicians. At that time, a national campaign on rheumatic fever was taken up with the help of the Government of Japan, and almost all mothers who suspected their children had some symptoms went to doctors and got treatment. As a result, rheumatic fever and rheumatic heart disease decreased sharply. At present, there were only old cases left.

However, Bangladesh has a different scenario for ischemic heart disease or cardiovascular disease. A recent publication by Choudhury in the Lancet have clearly shown an impressive reduction of maternal and infant mortality. As a result, life expectancy has gradually increased up to 70 years.

Additionally, Bangladesh's population is undergoing an age structure change. It is projected that by 2026 Bangladesh will have a largely middle-aged population, and by 2051 only aged people. This trend is also increasing the prevalence of coronary heart disease in Bangladesh.

Interestingly, the data from ICDDRB, an international research institute which had surveillance for rural areas, showed that cardiovascular disease was increasing exponentially even in rural areas.

In 2010, the WHO along with the Ministry of Health did the STEPS survey for non-communicable diseases in Bangladesh. This nationally representative survey was done with 10,000 people from all over the country. The survey result showed a very high prevalence of hypertension. On average 17% or 12 million people were hypertensive, and there was a sharp urban-rural difference. This was a huge number. Hypertension was one of the important risk factors for stroke and for coronary heart disease, and since a large number of people was exposed to hypertension, Bangladesh's health system had to be prepared for tackling this problem, which was almost impossible with the resource-constraint situation that Bangladesh was facing.

The STEPS survey also provided data about the measurement history and diagnosis of hypertension among respondents. It showed that one-third of the population had never measured their blood pressure. In men, this was about 44%, and in women about 22.8%, because women usually participate in an antenatal checkup program run by the government, where they get their blood pressure measurement done.

Bangladesh needs to think about how to address this high rate of hypertension, in a situation where it is very difficult to impose screening on the population. Hence, primary prevention strategies should be used that are accepted by the population.

One of the other risk factors for cardiovascular disease was tobacco use, and Bangladesh was one of the top 10 countries in the world with a high burden of tobacco use. Number one was China, then came India, and then Bangladesh. A Global Adult Tobacco Survey (GATS) was done in different low and middle income countries with the technical assistance and help of the WHO and the Center for Disease Control. This GATS data gave an opportunity to compare data between countries because the protocols were similar. The GATS data revealed that almost 45% of Bangladeshi adults aged 15 years or more smoke tobacco regularly. Fortunately, Bangladeshi women have a very low prevalence of tobacco use, only 1.5%. However, just like Thailand, tobacco use might be increasing in Bangladesh because the tobacco industry was actively targeting the women population by changing their marketing tactics. They offered things needed by women for household work free of cost if they bought 10 cigarette packets. As a result, the women become interested in collecting cigarette package, and could later on embark on smoking as well.

Another problem in Bangladesh was smokeless tobacco use, chewing tobacco. Chewing tobacco is based in the South Asian population and some Polynesian countries, as well as some Scandinavian countries like Sweden. There are various types of smokeless tobacco used in Bangladesh such as *zarda*, *patta*, et cetera. They are very toxic. The tobacco leaves are dried and mixed with chemicals. Heavy users used these tobacco leaves all the time. Betel nut was also commonly used. This is a culturally accepted behavior, and women are very much fond of it, almost 30% are using this. Previously the assumption was that men were not using smokeless tobacco, but GATS data showed that men were also using tobacco. That is becoming another problem for the tobacco control issue.

Another big problem with tobacco was secondhand smoking. Secondhand smoking caused a similar health problem, and Bangladesh was one of the countries where the highest number of people were exposed to secondhand smoking when they got out for work. Seventy percent of men and 30% of women reported exposure to secondhand smoke within the last 30 days. This was also turning out to be a big problem to control. In fact, the government of Bangladesh had been enacting different policies to control tobacco use.

A recent paper published by the ICDDRB clearly showed that odds for dying of stroke were 42% higher and of ischemic heart disease almost 94% higher for smokers than for never smokers. Hence, it was natural to expect a large number of cases in Bangladesh of ischemic heart disease, stroke, and others. The GATS survey compared the prevalence of tobacco use among countries, and this showed that Bangladesh is one of the highest tobacco user countries, while the UK and the US, who were the lowest users, were actually the highest producers of tobacco.

The NCD survey in Bangladesh also gave some information about the physical activity level. About 25% of the adult population in Bangladesh had low physical activity, less than 600 metabolic equivalent minutes per week according to GATS, while about 15% were overweight. The prevalence of obesity was very low in Bangladesh. A recent mapping published in the Lancet about age-standardized prevalence of obesity confirmed that it was very low in Bangladesh.

In the STEPS survey, the researches completed step 1 and 2, but could not complete step 3 because of a resource constraint. Step 3 was biochemical analysis. Hence, there was no national data for lipid levels, but small-scale surveys done in a small sample size found that the lipid level was low in the Bangladeshi population. It was less than 200 mg/dL in all age groups, except in the 45 to 54 age group, where it was a bit higher.

In Bangladesh, it was estimated by the International Diabetes Federation that 3.8 million or 4.8% of the population suffered from diabetes. This trend was increasing, and there was also a high urban/rural difference with the urban prevalence at about 8-10%.

The WHO has set nine voluntary global NCD targets to be achieved by 2025, and among them hypertension and tobacco use was given priority. Tobacco use had to be reduced by 30%, while hypertension should be reduced by 24%. However, before setting the target, there should be a baseline

for Bangladesh. There was data on the current prevalence of high blood pressure and on the prevalence of tobacco use, but there was no data on salt intake for the Bangladeshi population. One paper published by Asaria et al estimated that implementing a package of interventions which included tobacco and salt reduction was very cost effective. These two things together could reduce the cardiovascular disease incidence very cost effectively. The interventions for tobacco were revising the tobacco tax system, tobacco information and anti-advertising, and smoking restrictions and ban in advertisement. For salt intervention, there was a voluntary salt reduction in processed food. These set of actions would be effective in the prevention of cardiovascular disease in a cost-restrained environment.

In Bangladesh, over 95,000 people died each year from tobacco-related diseases, and the indirect costs of tobacco were very high; 5% of the household expenditures were spent on tobacco products, which was very high in terms of the low income of households. Bangladesh was not only a tobacco-consuming country, it was also a tobacco cultivating country. Since tobacco processing and curing needed lots of trees, these trees had to be burnt to dry tobacco. This was also contributing to the deforestation in Bangladesh, which is indirectly contributing to the food insecurity in Bangladesh. Many areas where tobacco companies have started cultivating tobacco have become food importing areas rather than food exporting areas.

The WHO has the MPOWER strategies for tobacco control, and Bangladesh is trying to utilize all these strategies. Bangladesh has signed a framework convention on tobacco control. It has enacted a law to ban tobacco advertisement. Smokeless tobacco is also under the law, and pictured warning is coming next. The number of public places restricting smoking has increased. All these efforts were being taken by the government and non-government organizations together. Previously, it was thought that Bangladesh could follow Thailand's model for tobacco restriction, but even the situation in Thailand has worsened.

Regarding the smuggling of illegal cigarettes, a few days ago some Bangladeshi economist wrote in the newspaper that the market was full of cheap illegal cigarettes. Therefore, he was urging the government not to increase tax on cigarettes, otherwise the government will lose revenue due to illegal cigarettes. This smuggling was in fact being done by the cigarette companies themselves. The government should be urged to take policies, and this being a broader issue, other things like trade acts and so on should also be readdressed in order to protect the health of the population.

The current prevalence of salt intake in Bangladesh was unknown, so the Heart Foundation did some small scale studies to get an idea of the level of salt intake in the Bangladeshi population. Professor Sohel stated that his work in Japan also involved estimating salt intake through 24-hour urinary sodium excretion. That work inspired him to do a similar kind of study in Bangladesh. However, salt intake measurement was very difficult, since one had to collect 24-hour urine and follow a very strict standard procedure to get an estimation. Hence, the Heart Foundation selected a small population of 400 people from both urban and rural areas with the objective of estimating the dietary salt intake by measuring 24-hour urine sodium and, also, 24-hour urine potassium excretion. The study result showed that the salt intake in the urban population was about 10 grams per day and in the rural population was 5.1 grams per day. This result was surprising because the expectation was that salt intake for both rural and urban areas would be close to each other. After excluding any systematic error, the probable explanation for this salt intake gap was that rural people were taking less calories than their urban counterparts, and hence were using less salt. To verify this, an energy-adjusted salt intake data may be needed to be looked at, but the study could not adjust for that energy intake. However, there is an option for expanding the study and looking into a larger sample size. But even in the smaller sample size age, BMI, and sodium/potassium ratio were found to be significantly associated with systolic and diastolic blood pressure. Additionally, sodium/potassium ratio has turned out to be more important than only sodium intake. Even in Bangladesh, where people take large amounts of vegetables, but don't take fruits regularly, if the level of potassium intake is raised, it may help in the primary prevention of high blood pressure. In fact, this urban salt intake was similar to other South Asian countries like India, Nepal, and Sri Lanka at 10 to 11 grams per day. One global report estimated that Bangladesh's salt intake was 6.9

grams per day. In 1990, the age standardized estimated sodium intake was 3.68 grams per day, and in 2010 it had become 3.54.

In South Asia, there was a very high level of coronary heart disease, but, importantly, this is occurring at a younger age; the average age of first heart attack is 53 years compared to 59 in other countries. Hence, this is very premature coronary heart disease. Other than that, the risk factors were similar in the Western and the South Asian population. There were traditional risk factors and nontraditional risk factors proposed, but these nontraditional risk factors are needed to be studied further to be established. Consequently, in South Asia the burden of CVD and NCDs have increased in an unprecedented scale. Hence, the principal scientific objectives of future studies should be to assess reliably the roles of established and emerging risk factors, that is, to understand the etiology of the diseases, to monitor trends, to compare CVD risk profiles between various population groups (the health transition theory can be tested in the Asian population), to determine the interplay between genes and environmental factors, to develop a "South Asian" risk score to predict future CVD risks (risk prediction), and to help in capacity building in terms of research and prevention.

As a result, the National Heart Foundation (NHF) initiated the Dhaka Urban Health and Cardiovascular Risk Assessment (DHAKA) Study. One urban area had been selected for the survey. The collection of data on biochemical tests was ongoing, and the plan was to follow them up for 5-10 years. In the meantime, the NHF also had collaborated with Cambridge University for a prospective population-based study to investigate the burden and determinants of major chronic diseases, called the BELIEVE study in Bangladesh. This study would be conducted soon in both urban and rural areas, starting initially with 12,000 urban and rural populations each. Another study had been started for non-communicable diseases on metabolic and social risk factors among the urban poor in Bangladesh, in collaboration with Nagoya and Osaka Universities, and various institutes of Bangladesh such as the Bangabandhu Sheikh Mujib Medical University (BSMMU) BSMMU, the NHF, and an NGO, the Environment and Population Research Centre (EPRC). Dr. Sohel believed that the outcome measurements from the above three studies once completed can answer many of the issues of Bangladesh.

Next, Professor Sohel talked about ways to reduce the CVD burden in Bangladesh. Life course approach could reduce the CVD burden by tackling malnutrition and under nutrition in fetal and neonatal life through nutritional programs. If the fetus was exposed to malnutrition, then the child had higher probability of developing heart disease. Hence, pregnant mother's nutrition should be looked into. There should also be tobacco control. Additionally, dietary guidelines should be there for chronic disease prevention and health promotion. Unfortunately, Bangladesh doesn't have any dietary guideline. Hence, people don't know what they were eating. The government should put food labels so that people can read what they are buying. Policy regulations were needed to improve the urban environment and transportation.

Dhaka was one of the most densely populated cities of the world, and one of the worst cities of the world to live in. Bangladesh's health system was still oriented towards infectious disease control, which needed to be changed. These were common problems faced by low and middle income countries. As Dr. Mek stated, only the Ministry of Health was working on non-communicable diseases, but the fight had to be multi-sectoral. Bangladesh was also focusing mostly on treatment. Prevention was not a priority. Additionally, the health service delivery system was weak and fragmented. There was also an urgent need to fill the data gaps on NCD research in Bangladesh.

Lastly, Professor Sohel briefly talked about a Lancet paper titled 'Bangladesh Paradox: Exceptional Health Achievement despite Economic Poverty'. The paper stated that Bangladesh was doing far better than other neighboring countries, but still, Bangladesh is very resource-constrained. In terms of life expectancy and reduction of infant mortality and under-five mortality, Bangladesh is doing better than many neighboring countries. The study was done through the combined efforts of the government and non-government and development partners. Hence, Professor Sohel concluded that if the government and non-government and development partners join together, then the problem of NCDs could be overcome in the future.

Questions and Answers

Question #1
Professor Peiyu Wang wanted to know why cardiovascular disease, stroke, and diabetes were still at quite high level, if cardiovascular risk factors such as obesity and alcohol use were low in Bangladesh, except for the high tobacco use.

Professor Sohel replied that they were also looking for the reasons why South Asians were having high rates of coronary heart disease despite of the comparatively low risk factors. This could be related to the rapid economic development of South Asian countries. Comparatively, the western countries had taken a longer time for this economic development, and as a consequence the food intake of their population had gradually increased. But as for the South Asian population, because of the sudden economic development their body didn't have time to adapt. Another factor was that the health system in the South Asian region was not prepared to cope with such health crisis. Additional factors could be hereditary risk factors, and therefore some of the cohort studies might provide an answer in the future.

Question #2
Professor Peiyu Wang asked what did smokeless mean in Dr. Sohel's presentation.

Professor Sohel replied smokeless meant chewing tobacco instead of smoking it, which is also found in the Palau region. Ms. Berry Moon Watson explained that there was also a new variety of smoking becoming prevalent in US, which was odorless. This could be purchased online. Professor Sohel stated that perhaps Ms. Berry was talking about electronic cigarettes, which was becoming a new phenomenon in Bangladesh too, although it was quite expensive. However, he didn't know what proportion of the people would buy and use it, but its usage could decrease in the future due to the cost factor.

Question #3
Mami Wakabayashi commented that her personal experience of Bangladesh was that there was a big gap in the social determinants of health between rural areas and Dhaka, the capital. Also, her experience of the rural food culture was that it contained only a small amount of salt, and so if Bangladesh maintained their food culture, their salt intake would be less. However, she was concerned about the sugar intake, as drinking tea was a popular culture in Bangladesh. Hence, this social factor was also creating a difference between the rural and the urban areas. She wanted to know what Professor Sohel thought about that.

Professor Sohel agreed that in the rural population the salt intake was low, probably because they were not exposed to processed food and only ate homemade food. Also, the total intake of calories was low, which was affecting the level of salt intake. However, this theory needed to be investigated more before coming to a conclusion.

Question #3
Professor Aoyama also agreed with the idea that perhaps the high intake of processed food was leading to high salt intake too, which she also saw in Palau. This could also be a concern for Palauan people. She shared her experience of a recent visit to Ethiopia to start an NCD study, and mentioned that because of the problem of iodine deficiency, people were using iodized salt. Maternal health workers usually recommended mothers to take salt because of the iodine. Since iodine deficiency was known to be prevalent in Bangladesh as well, people might need to take some amount of salt. She asked Professor Sohel how people could take enough iodine while reducing salt intake.

Professor Sohel pointed out that this issue was always being discussed in the meetings in Bangladesh, but they, along with the Ministry of Health, had reached a consensus that if all edible salts were iodized, then a person needed to take 5 grams of salt per day, which is adequate. Hence, the emphasis was on the need to make all salt iodized, but not on asking people to take more salt.

Question #4
Ms. Hashimoto stated that in Japan the onset age for lifestyle-related diseases was 40 years or older. However, Professor's Sohel's presentation showed the CHD onset at age 30 or above in Bangladesh. Hence, she wanted know why the age was so early.

Professor Sohel replied that the age 30 years or more was the cutoff age that the WHO prevalence study had used. The study was done with people more than 30 years old.

Question #5
Professor Aoyama pointed out that not just the rapid progress or improvement of the economic-social status could cause the CHD issue; it may be related to childhood malnutrition, which was known to increase diabetes risk. That could be an issue in Bangladesh.

Professor Sohel explained that when babies were exposed to malnutrition, they developed hypertension and the probability of heart diseases. However, such data were only available from western studies, and there was no such data from Bangladesh to look into the issue. Hence, it was not possible to answer whether malnutrition was the important risk factor for chronic heart disease, or the rapid change of lifestyle, but the chance was that the rapid change of lifestyle was a more unfavorable risk factor than maternal nutrition. This was because maternal nutrition was being taken care of in Bangladesh for the last 20 years.

General Discussion: Countermeasures for NCDs and Further Collaboration

Yonghua Hu

Applauding the discussion so far, Professor Yonghua Hu felt that many speakers gave excellent talks. The presentations in the morning on the Palau Study, China's Fangshan Cohort Study, and the Thai Cohort, then in the afternoon from the Thai Ministry of Public Health and form Bangladesh contained very interesting comments about policy and prevention of NCDs. Everybody got to learn from each other by sharing experiences of their countries. In whole Asia, the economy is increasing and the lifestyle has changed, and as a result non-communicable diseases were increasing steadily. However, unfortunately most Asian countries do not have enough power for prevention. Professor Hu explained that he knew this from experience, because he had NCD prevention experience when he was in China, as well as in Japan in Osaka University. In the last 2-3 decades NCD had increased, and now the researchers know how to deal with this situation and how to face the situation. Professor Hu stated that everybody needed to work together and share their different countries' experiences, be it in public health, in research, or in the field of NCD prevention. A joint cohort study could also be done using IT information technology and big amounts of data. That way information and data could be shared among many countries. This also meant that the traditional method of studying epidemiology was changing.

Intervention Component of School Health Screening

Sherilyn Madraisau

Ms. Sherilyn stated that she had a few slides to present, which actually was the second part of Ms. Berry's presentation. This was about the "Intervention Component of School Health Screening". The presentation would explain what were the next steps taken after the children in Palau were health screened and identified to have health problems. The presentation would also outline briefly some of the interventions being taken in Palau as well as some of the ongoing policy initiatives.

After the school health screening, children suffering from health issues were given referrals to specialty clinics. For instance, in 2013 757 students, and in 2006 588 students, which is over 50% of the school population, required some treatment or follow-up care after the school screening.

Students who had dental caries were referred to dental clinics, students with hearing disorders were referred to the ENT clinic, and some students were referred to eye clinics. Students with special needs or conditions, including those identified to be obese or overweight, were referred to pediatric high risk clinics, nutritionists, or MCH nurses to provide follow-up care. Students identified with heart problems were referred to cardiologists. Students with academic issues were referred to tutoring programs. Other students requiring mental health or behavioral health counseling were referred to the adolescent health program for further counseling. Counseling was provided not only to the students, but also to the parents if needed.

The school health clinic provided education on nutrition and physical activity, reproductive health, and basic general hygiene, counseling on alcohol, tobacco and other drugs, and bullying education and prevention. Individual counseling is also provided on various issues. There were approximately 2039 encounters in 2006 and 254 encounters in 2013 for targeted individual counseling, on issues such as bullying, smoking, personal hygiene, and diet and exercise. In terms of legislative measures and policies, they were working together with schools and parents to make the annual health screening mandatory for all schools, which at present was not mandatory. The parents have to consent for their child to be screened. Also, it was important to set a standard guideline for the National Framework for Childhood on healthcare and early care education for the early childhood population. More importantly, work was going on to mandate physical activity in all schools, so that every grade will be required to have some sort of physical activity on a daily basis. In terms of system change, work was going on with the schools to implement health initiatives in the schools. Work was also going on with the Ministry of Education to integrate health and PE together, to provide training for teachers, and to get the community to be more involved in the health and physical activity of the students.

One of the health initiatives that had been implemented at school level was the school gardening project, supporting schools in creating a gardening project. This would essentially supplement and support a healthy luncheon for students. Additionally, work is taking place with schools on implementing school policies, such as allowing only drinking water in schools and not any kind of sweetened drinks. Regarding community involvement, steps had been taken in implementing small initiatives at school level in terms of healthy eating and physical activity in three states: Melekeok, Peleliu, and Ngeremlengui. Thus, a group of parents decided to form an exercise program after school, where parents and students can get together and do some physical activity. In one of the states, the school had decided that students would not ride a bus to school, but would walk from their house. These were small initiatives supported by schools as preventive measures for NCD and obesity.

Presently, education was being conducted by going to schools and talking to school administrators. Various presentations had also been done at the parent-teacher association, specifically about health issues common to its community, to get the parents to support the screening initiative, and to get feedback from the community in terms of what works and what does not in their community. A referral protocol and process had also been established with other collaborating agencies such as the Ministry of Education, Community and Cultural Affairs and other Faith-Based NGOs. A software had been developed to calculate BMI and hypertension, which was being used on site during school health screening. Those children who were on-site identified to be overweight and/or hypertensive were provided further follow-up and care.

In conclusion, the prevalence of obesity amongst the students was at 18.6% in 2006, and 19.1% in 2013. However, in terms of overweight there has been a decline from 16.3% in 2006 to 13.4% in 2013. Two of the most significant risk factors for overweight were the moderate to sedentary level physical activity and the problems with eating pattern. Other significant health and psychosocial outcomes associated with being overweight were being hypertensive and being bullied at school. Again, the School Health Screening Program had identified, referred, and managed students who had problems. Systems and programmatic actions were currently on the way not only for responding to problems related to overweight, but for the general health of the children.

Lastly, Ms. Sherilyn commented that screening schoolchildren identified those who are in need of counseling and medical interventions, thus their quality of life could be improved. Additionally, determining the magnitude of overweight and illnesses related to it put a face on these problems and enabled providers and planners to act with urgency. Introducing legislative measures, systems, and other programmatic changes are also needed to be done in the fight against NCD.

Hiroshi Yatsuya

Professor Yatsuya commented that today's discussion enlightened all the participants about the subject of NCD. Additionally, the participants also got the knowledge of what should be done to tackle the issue. However, it is still difficult to know how exactly the interventions should take place or to whom it should be targeted. The special aim of the China and Bangladesh studies could be perceived as how to address this problem. It would be interesting to understand from sociological studies why people act the same way and do not change their behaviors, although they have a lot of knowledge about unhealthy behaviors such as smoking. The issue of people struggling to change their behaviors was interesting.

Professor Yatsuya remarked that the response to the problem of NCD was related to how this problem was seen by the people. This was because contrary to infectious diseases or clinical diseases, NCD is more complicated. An infectious disease can be seen as a public responsibility and as an issue of public health. Therefore, it was easy to intervene. However, non-communicable disease is seen as a private responsibility, and therefore becomes difficult to tackle. The basic common understanding needed was that the NCD problem was not just the responsibility of the individual, but also a public responsibility, and therefore everybody should see this problem as a part of public responsibility. Also, detailed studies and investigations were needed to know what future steps should be taken in order to solve this NCD crisis.

Conclusion

Hiroyasu Iso

In conclusion of the day's program, Professor Iso thanked all the speakers and the participants. The discussion showed that many countries, including Palau, China, Thailand, and Bangladesh have similar problems for NCD with some variations. Professor Iso felt one strategy to tackle the NCD crisis in the future was to try to educate people. Early childhood education from birth to teenage age and the education of college students were especially important. It may also be very important to formulate good healthy behaviors, and also to improve healthy behaviors for the prevention of non-communicable diseases. Another area to work on was the environment, in terms of how to reduce the intake of products like salt, sugar, and fat through the improvement of the environment and food products. However, the bad issue was that tobacco companies were producing these harmful products generally because people demanded it. However, if people didn't buy these products, these companies would shift to other more healthy products. The urban environment must also be planned properly to include roads and parks which makes it easier for people to exercise. Another aspect to discuss further was reflecting on policies.

研究成果の刊行に関する一覧表

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REVIEW

Global Trend in Overweight and Obesity and Its Association With Cardiovascular Disease Incidence

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Although the global prevalence of both the overweight and obese is on the rise, there are variations among regions or countries, and sexes. Approximately half or more than half of the population are overweight/obese defined as body mass index ≥25 kg/m^2 in the Americas (61.1%), Europe (54.8%), and Eastern Mediterranean (46.0%) according to the World Health Organization, while a much lower prevalence is observed in Africa (26.9%), South-East Asia (13.7%), and the Western Pacific (25.4%). Females are more likely to be overweight/obese in the Eastern Mediterranean, Africa, South-East Asia and the majority of countries in the Americas and Western Pacific but not in the most of the countries in Europe. These region-sex-ethnicity differences in prevalence may be a clue to the causes of the obesity epidemic. Epidemiological studies done in the USA, Europe, and Asia found that higher BMI was significantly associated with increased incidence of coronary artery disease (CAD) and ischemic stroke, but the association with hemorrhagic stroke incidence was not always consistent. The association of BMI with CAD and ischemic stroke was generally independent of known mediators, which would indicate the importance of controlling or preventing overweight/obesity for the prevention of cardiovascular disease.

Key Words: Coronary artery disease; Epidemiology; Ischemic stroke; Obesity; Stroke

Obesity is a state of excess fat accumulation that accompanies wide range of health disadvantages. The World Health Organization (WHO) defines a body mass index (BMI) of ≥25 kg/m^2 as overweight, and a BMI of ≥30 kg/m^2 as obesity.[1] The global prevalence of the overweight and obese is on the rise.[2] The Global Burden of Disease Study estimated that the proportion of overweight or obese adults in 2013 was 36% in men and 37% in women worldwide.[3] Globally, the epidemic has affected both developed and developing countries, men and women, and adults and children, although there are great variations in their prevalence and trends among regions or countries, and sexes.

Because obesity is believed to cause a number of established risk factors for cardiovascular diseases (CVD) such as hypertension, dyslipidemia, and diabetes,[4] the growing prevalence of obesity is assumed to increase the global CVD burden. However, it is also known that other changes in diet and lifestyle have led to changes in the prevalence of these risk factors, and presumably in CVD incidence.[5,6] An example of this would be a dramatic decrease in stroke mortality observed after World War 2 in Japan because of the decrease in severe hypertension,[7] although the average BMI also increased during this period.[8–10] Therefore, the association of obesity with CVD remains to be investigated, especially in terms of differences in the association by time period as well as how the association (if any) would be mediated by the established risk factors.[11] Also, there may be differences in the threshold of BMI where significant BMI would be observed, because significant differences exist in the prevalence of obesity by sex and ethnicity. Hence, we set 2 aims in this review. The first aim was to provide an overview of global trends of overweight and obesity according to the WHO regions and countries within each region by sex. The second aim was to provide up-to-date information on cohort studies that have investigated the associations of BMI with coronary artery disease (CAD) and stroke in various parts of the world.

Methods

Overweight and Obesity Trends

The review compiles the prevalence of overweight and obesity for every country in the WHO's 6 regions of the world (Africa, the Americas, Eastern Mediterranean, South-East Asia, Western Pacific, and Europe).

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