PHYSIOLOGY RESEARCH DIVISION

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The division has involved in research projects on sports physiology, non communicable diseases, metabolic diseases, and aging. The division has provided academic services such as teaching of post graduate students attending Universities of Medicine.

RESEARCH PROJECTS

1. NON-COMMUNICABLE DISEASES

1.1. SPORT PHYSIOLOGY

1.1.1. Cardiopulmonary fitness of adolescent students of Institute of Sports and Physical Education, Yangon

A cross-sectional descriptive study to determine the cardiopulmonary fitness and to find out the association between maximal oxygen uptake and anthropometric parameters of 14 to 16 years old 98 adolescent students (49 boys and 49 girls) was conducted at Institute of Sports and Physical Education (ISPE), Yangon. The cardiopulmonary fitness as a maximal oxygen consumption (VO_2max) was determined by using Bruce protocol. In October, 2014, after primary screening such as electrocardiogram and random blood sugar, the test was performed by using computerized treadmill at Physiology Laboratory, DMR. The results showed that the boys and girls had no significant difference in age (15.18 ± 0.99 years vs 15.06 ± 0.77 years) (mean $\pm$ standard deviation (SD) and body mass index (BMI) (20.30 ± 1.59 kg/m^2 vs. 20.42 ± 1.72 kg/m^2), boys had significantly higher height (167.21 ± 4.81cm vs. 155.44 ± 4.53 cm, $p<0.001$) and weight (56.76 ± 5.08 kg vs. 49.24 ± 4.66 kg, $p<0.001$) than girls. It was observed that boys' VO_2max (53.55 ± 9.02 ml/kg/min for boys vs. 39.79 ± 12.64 ml/kg/min for girls) as well as exercise time (10.61 ± 1.13 minutes vs. 9.45 ± 1.16 minutes) were significantly ($p<0.001$) greater than girls but maximal heart rate (HR$_{max}$) had no significant difference in terms of gender (175.81 ± 11.96 beats/minute vs. 174.17 ± 9.59 beats/minute). This was to be expected, cultural factors encourage physical activity and the resultant muscular development for boys more than girls. In 1996, one UK study offer typical values for boys of 48 to 50 ml/kg/min during adolescence, while for girls, their figures are 39 to 45 ml/kg/min. The VO_2max values from this study were found to be not much different

from that of the UK study. In this study, BMI of boys had significant positive association (r=0.11, p < 0.000) to VO_2max values and that of girls had significant inverse association (r= -0.18, p < 0.000) to VO_2max values. This was probably due to higher BMI of girls who have relatively more body fat than boys. Similar inverse association was found in a study conducted in 13-17 years old adolescent students of Babol City, Iran. Therefore, this study shows that a normal BMI is required for good cardiopulmonary fitness. It is hoped that the data from this preliminary study will serve as a base-line data for future large population-based studies on cardiopulmonary fitness status of adolescent students in Myanmar.

1.2. OBESITY

1.2.1 Relationship between body fat composition, leptin sensitivity, insulin sensitivity and resting energy expenditure in non-obese and obese adults

Leptin resistance is the main biological abnormality in human obesity. It is of great importance to develop tools for quantifying leptin sensitivity/resistance in humans, in order to investigate clinical courses of patients with leptin resistance and the outcomes of therapeutic interventions. A simple, feasible test for identifying leptin resistance individuals is important for both population based research and clinical practice in planning optimal management strategies for patients with obesity. To investigate the usefulness of body mass index (BMI) or resting energy expenditure (REE) as a component in leptin sensitivity index formula, a cross-sectional study was conducted in 20 to 55 years old non-obese (n=42) and obese (n=45) adults. BMI was calculated as the ratio of weight in kilogram to height in meter square (kg/m^2) after measuring height and weight according to standard procedures. REE was measured by using indirect calorimetry after overnight fast and resting for 30 minutes before the test. Serum leptin level was determined by enzyme linked immunosorbent assay method. Then, leptin sensitivity was calculated by 2 formula as described in the international literatures: leptin/BMI and REE/leptin. Results showed that there was a significant negative correlation between these two formula in expressing leptin sensitivity in the study groups (p<0.000, r= - 0.55). Thus, BMI and REE can be used as a component in leptin sensitivity index formula despite REE measurement is impractical in clinical practice and is difficult to perform in population practice based research studies.

1.3. METABOLIC DISEASES

1.3.1. Assessment of erythrocyte magnesium and serum calcium level in postmenopausal women

Many trace elements such as calcium, magnesium, zinc, copper and selenium are essential for normal growth and development of skeleton. Among them magnesium plays important role in bone metabolism as magnesium can help calcium absorption. Without the proper balance of magnesium to calcium, good bone health cannot be achieved. Therefore, this study aims to assess the erythrocyte magnesium and serum calcium level in postmenopausal women. A cross-sectional descriptive study was conducted on postmenopausal women from Shwe Pyi Thar Township, Yangon Region. After explaining the purpose of the study, the participants were chosen according to selection criteria. History taking and physical examination was done. Bone mineral density was measured by using bone densitometry to all postmenopausal women. After grouping of 99 postmenopausal women into 3 groups (normal, osteopenia and osteoporosis) according to T-score, venous blood was collected for erythrocyte magnesium and serum calcium concentration. The erythrocyte magnesium level was measured by magnesium Calmigate method by using Spectrophotometer within 24 hours. The serum total calcium level was measured by CPC

(o-cresolphthalein-complexone) method and the concentration (optimal density) was read by spectrophotometer. The mean age of all participants was 62.06±9.77 year. The mean age of menopause in this study was 46.28±5.1 year. In our study, 42.4% of postmenopausal women avoided some foods such as red meats, peas and some kinds of fruits and vegetables. The mean erythrocyte magnesium level (3.48 ± 0.71mg/dL) and serum calcium level (9.29 ± 0.94 mg/dL) were significantly lower (p<0.05) in osteoporotic postmenopausal women than in either osteopenic (3.93 ± 1.04mg/dL and 9.91 ± 2.31mg/dL) or normal (4.07 ± 1.14mg/dL and 10.69 ± 2.44mg/dL) postmenopausal women. The significant positive correlation was found between erythrocyte magnesium and T-score (n=99, Pearson's r=0.24) and serum calcium and T-score (n=99, Pearson's r=0.23). It means that magnesium could be as important to bone health as calcium. Magnesium converts vitamin D into active form so that it can help calcium with respect to bone health. Therefore, it can be concluded that proper balance of magnesium and calcium gave normal growth and development of bone.

1.4.   AGING

1.1.1.   Physical fitness of the elderly at the Home for the Aged (Hninzigone), Yangon

A cross-sectional descriptive study aimed to assess physical fitness in Myanmar elderly (above 70 years) by using the Senior Fitness Test in comparison to the US norms. One hundred and forty five elderly; 52 men (mean ± SD, 81.23 ± 6.36 years) and 93 women (79.03 ± 5.27 years) from the Home for the Aged (Hninzigone), Yangon volunteered for the study. Each person was asked to perform six tests of the senior fitness test; 30-second chair stand test to assess lower body strength; 30-second arm curl test to assess upper body strength; Chair sit and reach test to assess lower body flexibility; Back scratch test to assess upper body flexibility; 8-Foot up and go test to assess dynamic balance and 2-minute step test to assess aerobic endurance.

Body fat percent was calculated after skin-fold thickness measurement. Elderly men and women were divided into 5 groups according to age (Table-1). Most of elderly women had lower BMI and higher body fat percent than elderly men in all age group. The older the age, the higher the reduction were observed in BMI and body fat percent. All the elderly had completed the six fitness tests. Scores from each test were compared to Americans' norms by subject's age and gender and described as performance better than the norm, same as the norm, or worse than the norm. Generally, performance was better in strength tests (chair stand and arm curl) than cardiovascular tests (2- minute step and 8-foot up and go) or flexibility tests (chair sit and reach and back scratch) (Table-2). Test performance did not differ by gender and age. Since little information is available on the physical fitness of Myanmar elderly people due to technical difficulties, the results from this preliminary study will serve as a base-line data for future population-based studies and intervention studies on physical fitness of elderly in Myanmar.

Table 1. Basic characteristics of elderly men and women

	70-74 years		75-79 years		80-84 year		85-89 years		>90 years	
	Men (n=6)	Women (n=20)	Men (n=17)	Women (n=34)	Men (n=15)	Women (n=25)	Men (n=8)	Women (n=11)	Men (n=6)	Women (n=3)
BMI (kg/m^2)	25.2 ± 5.32	23.9 ± 4.41	23.16 ± 4.0	23.84 ± 6.0	23.28 ± 3.05	23.21 ± 5.58	20.43 ± 3.76	19.68 ± 4.35	20.98 ± 2.8	22.02 ± 4.5

Body fat (%)	23.78 ± 8.03	25.29 ± 6.08	21.69 ± 6.12	23.84 ± 6.0	19.85 ± 4.97	23.47 ± 6.61	15 ± 4.79	19.62 ± 4.89	16.53 ± 3.8	22.23 ± 6.73

Table 2. Physical fitness of elderly men and women in compared to US norms

Test	Worse than norm		Same as norm		Better than norm	
	Men No. (%)	Women No. (%)	Men No. (%)	Women No. (%)	Men No. (%)	Women No. (%)
Chair stand	10 (19.23%)	22 (23.66%)	25 (48.08%)	49 (52.69%)	17 (32.69%)	22 (23.66%)
Arm curl	2 (3.85%)	4 (4.3%)	24 (46.15%)	25 (26.88%)	26 (50%)	64 (68.82%)
2 minute step	28 (53.85%)	43 (46.24%)	22 (42.31%)	49 (52.69%)	2 (3.85%)	1 (1.08%)
Chair sit and reach	13 (25%)	19 (20.43%)	16 (30.77%)	29 (31.18%)	23 (44.23%)	45 (48.39%)
Back scratch	29 (55.77%)	53 (56.99%)	7 (13.46%)	15 (16.13%)	16 (30.77%)	25 (26.88%)
8 foot up and go	31 (59.62%)	78 (83.87%)	16 (30.77%)	15 (16.13%)	5 (9.62%)	0 (0%)

SERVICES PROVIDED

ACADEMIC

Sr.	Name	Course	Responsibility
1.	Dr. Khin Mi Mi Lay	1st year MMedSc (Physiology) Universities of Medicine	Lecturer/ co-examiner
		2nd year MMedSc (Physiology) Universities of Medicine Workshop on Research Methodology (2015)	Member of post graduate academic board of studies Facilitator
2.	Dr. Nway Htike Maw Daw Htike Htike Soe Daw Yi Yi Mon	1st year MMedSc (Physiology) Universities of Medicine	Demonstration of Lung function and shuttle run
3.	Daw Khin San Lwin Daw Le' Le' Win Hlaing	1st year MMedSc (Physiology) Universities of Medicine	Demonstration of Ergometer and Handgrip Dynamometer
4.	Daw Sandar Win Daw Htet Htet Lwin	1st year MMedSc (Physiology) Universities of Medicine	Demonstration of skin fold caliper and Leg strength

INTERVIEW

1. Interview with Dr. Khin Mi Mi Lay on Physical Inactivity and Non-communicable diseases was done by Sky Net