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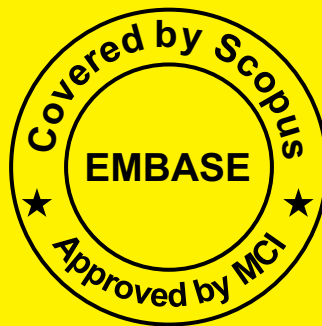
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Contents

Volume 10, Number 3

March 2019

1. A Study of Financial Counselling and Estimation of Variance between Estimated Bill and Actual Bill of Cardiac Cath Lab 1
Brig. A P Pandit, Harshada Tambe
2. Alienation, Attachment Style, and Alcohol Addiction “A Study of Young Women Habitual Drinkers” 9
Bhawani Singh Rathore, Uma Joshi
3. Challenging Issues in Health Economics 15
S. N. Sugumar, C. K. Gomathi
4. Examining the Impact of Development Projects’ on the Project affected People: A Study in Kalinganagar Industrial Estate, Odisha, India 20
Chandrakanta Sahoo, Shukadeb Naik
5. Effectiveness of Hand Muscle Strengthening Exercises on Dominant Hand Pinch Strength in Smartphone Addicted Collegiate 26
D. Malarvizhi, A. Abinaya
6. Effect of Traction Versus Counter Traction with Conservative Treatment on Adhesive Capsulitis 31
Divya Nitin Lad, S. Anandh
7. Efficacy of Probiotic Drink Containing *Lactobacillus Casei Shirota Strain* on Factors affecting Dental Caries 36
Mary Byju, Kundabala Mala, Neeta Shetty, Ramya Shenoy, Shrikala Baliga
8. Health Expectancy Under Dynamic Set Up for India and its Selected States 42
Mompi Sharma
9. IoT based E-Critical Care Unit for Patients In-Transit 46
Naveen Kumar, Surya Narayan Panda, Preethi Pradhan, Rajesh Kaushal
10. The Influence of Moderate Intensity Exercises on Fatigue and Quality of Life in Cancer Patients Undergoing Chemotherapy 51
Neelam Tejani, S. Anandh
11. The Effectiveness of Planned Educational Intervention on Knowledge and Skills in Home Care Management among Care Givers of Patients with Spinal Cord Injury 56
Nila KM, Kanmani. J, Laly KG
12. Microbiological Evaluation of Polytetrafluoroethylene (PTFE) Tape, Cellulose Sponge and Cotton as Spacer Materials Combined with Intracanal Medicament- An in Vitro Study 61
Aditya Shetty, Payal Garg, Mithra N. Hegde, Lakshmi Nidhi Rao, Chitharanjan Shetty, Shishir Shetty
13. Socio-Demographic and Cultural Factors Influencing Treatment Outcomes among Patients with

Tuberculosis Attending Tribal Health Care Centers of H. D. Kote Taluk, Mysuru District	66
<i>Prakash Boralingiah, Dennis Chauhan</i>	
14. Language Proficiency among Higher Secondary Students with Respect to Psychological Factors	72
<i>R. Jeyanthi, S. Arockiadoss</i>	
15. Profile of Patients Who Underwent Abortion in Tertiary Medical College in Trichy: A Descriptive Study	76
<i>Raghuram V, Shankar S, Betty Janice A, Brammamuthu S, Chezian V M, Elango. S</i>	
16. Role of MDCT in Evaluation of Acute Abdomen	79
<i>A. Sravan Krishna Reddy, S. Shrinivasan, S. Sajith, R. Chidambaram</i>	
17. Patterns and Distribution of Dental Caries and Dental Fluorosis in School Children of Sivakasi	85
<i>A. Ashwatha Pratha, S. Gheena</i>	
18. Prevalence of Reproductive Tract Infections and Treatment Seeking Behavior among Women of 15-49 Years Age Group in Haldwani Block, District Nainital, Uttarakhand, India	89
<i>Neha Verma, Sadhana Awasthi, Chandramohan Singh Rawat, Rajesh Kumar Singh, Bithorai Basumatary</i>	
19. Sustainable Agriculture and of Irrigation Practices in India	95
<i>Arasheethbanu</i>	
20. A Study to Assess the Knowledge Regarding Cervical Cancer Screening and Prevention among Women in Rural Areas in Trichy	99
<i>Shankar. S, Raghuram V, Elango, Sowndarya S, Sharumathi R R, Sasirekha P</i>	
21. Study on Utilization of Breast Feeding Booths in Major Bus Terminals by Lactating Mothers in Selected Districts of Tamil Nadu	103
<i>Shankar S., Raghuram V, Elango, N. Leka jothi, K. Madhubala</i>	
22. Study to Assess Knowledge, Practice and Attitude of about Self Breast Examination among Women in Field Practice Area of a Medical College in Trichy	108
<i>Raghuram V, Shankar S, Suganya S, Suganthi S, Suhaanth G, Tharan Kumar S, Elango S</i>	
23. Study on Profile of Pregnancy Outcomes in a Tertiary Care Hospital in Trichy, South India	112
<i>Shankar S, Raghuram V, Swarnalatha P, Thendral Vasan P, Swathi S, Elango S</i>	
24. A Study of Knowledge, Attitude and Practice Regarding E-waste Management among Nursing Students at a Tertiary Care Hospital	117
<i>Amit A Mane, Sujata V Patil, P M Durgawale, S V Kakade</i>	
25. Hostile Tobacco and Oral Health—A Review	123
<i>T.Sarumathi, Krishnan Mahalakshmi, S. Raghavendra Jayesh, B. Krishna Prasanth, Sindhu Poovannan</i>	
26. Soft Tissue and Alveolar Bone Repair of Platelet Rich Fibrin Over Platelet Rich Plasma in Extraction of Impacted Third Molars	129
<i>B. Saravanakumar, A. Julius, S. Raghavendra Jayesh, B. Krishna Prasanth</i>	
27. Workplace Spirituality and its Impact on Organizational Commitment and Employees' Job Satisfaction amongst Higher Educational Institution Teachers	132
<i>Dayal Sandhu</i>	
28. The Role of MRI in Non-Traumatic Chronic Hip Joint Pain	137
<i>Dhanashree More, Pramod Shaha, Sonesh kumar Chougule, Utakarsha Patil, Kapil Sawarkar, Ria Rai, Dhirajkumar Mane</i>	

29. Computed Tomography Evaluation of Mediastinal Masses	143
<i>Utkarsha Patil, PramodShaha, Omkar Patil, Dhanashree More, Dhirajkumar Mane</i>	
30. Knowledge, Attitude and Practice among 13-15 Years Old School Children Towards Oral Hygiene	149
<i>Prashaanthi Nagaraj, Geo Mani</i>	
31. A Study on Awareness about Self Medication Practices among Working People in Kerala	154
<i>Anusree M., Gokul K. C., Girish S</i>	
32. Salivary Cortisol Level; Its Role in Stress Induced in Patients Undergoing Dental Treatment; An in Vivo Study	159
<i>Sumit Singh Phukela, Ashish Dabas, Reshu Madan, Shefali Phogat, Manoti Sehgal, Jaiveer Singh Yadav</i>	
33. Health Care Services by Primary Health Centres in Uthamapalayam Taluk in Theni District of Tamil Nadu-An Economic Analysis	163
<i>S. Saravanan, M. Ramesh, S. N. Sugumar, S. Sudha, Prof. Teluswarnna, Prof. Rajarethinam Emmanuel</i>	
34. School Teacher's Knowledge, Attitude and Practices Regarding Oral Health in Ballabgarh Block, Faridabad	169
<i>Neha Verma, Meena Jain, Nisha Rani Yadav, Souryaa Poudel, Ankur Sharma, Vishal Jain</i>	
35. Representation of Knowledge Through Ontology for Swine Flu Disease in Semiarid Tropical Regions	172
<i>P Radhika, P. Suresh Varm, N. Lakshmi Kalyani, P. Rama Krishna, M. Santosh Kumar</i>	
36. Knowledge, Attitude & Practices Regarding Prevention of Dengue and Malaria among Residents of Urban Area in Kolhapur City, Maharashtra	177
<i>Pallavi A. Potdar</i>	
37. Comparative Evaluation of Efficacy of Oral Diazepam and Buspirone in Reducing Anxiety and Discomfort in Mandibular Third Molar Surgery- In Vivo Study	182
<i>Sushmita Mitra, Kalyani Bhate, Santhosh kumar S. N., Kapil Kshirsagar, Bhagyashree Jagtap, Pradnya Kakodkar</i>	
38. Post Marital Depression among Women	187
<i>Vidyadhari Pedaprolu, Priya. M</i>	
39. Various Techniques Used to Diagnose Psychogenic Non-epileptic Seizures (PNES): A Brief Overview	190
<i>Priyesh Kumar Singh, Naveen, Tara Singh, Vijay N. Mishra, Rameshwar N. Chaurasia, Trayambak Tiwari</i>	
40. A Study on Problems and Difficulties in Implementing Knowledge Management Practices in Education Sector	195
<i>R. Priya, J. John Adaikalam</i>	
41. A Comprehensive Study on Novel Hybrid Approach for Decision Support System in Disease Diagnosis	200
<i>K. Sharmila, C. Shanthi, R. Devi, T. Kamala Kannan</i>	
42. Management of Calcific Metamorphosis with Minimally Invasive Porcelain Veneers–A Case Report	205
<i>Shreya Hegde, Swathi Pai, Roma M</i>	
43. Performance of Indian Agricultural Export-An Analysis	208
<i>S. Gunaseelan, N. Kesavan</i>	
44. An Early Infected Lung Identification and Verification Module Using Neural Classifier	212
<i>S. Sandhiya, Y. Kalpana</i>	

45. Assessment of Inflammatory Markers in Hemolytic Crisis with Special Reference to Sickle Cell Anemia 219
Prashant Nigam, P. K. Patra, Lakhan Singh, Ramnesh Murthy
46. Correlation of Foot Length and Gestational Maturity in Neonates—A Study from Coastal Karnataka 223
Rose Ann Roy, Suchetha S Rao, Prasanna Mithra
47. Clinical Profile of Children with Autism Spectrum Disorder: A Study from Coastal Karnataka 228
Shebna A Khader, Suchetha S Rao, Nutan Kamath
48. A Study on the Nutritional Status of the School Going Adolescents of East Sikkim, North East India 232
Tshering Dolkar, Brig. V K Mehta, J T Wangdi
49. The Combined Effect of Continuous Run, Alternate Pace Run and Fartlek Training on Selected Physiological Variable among Male Athletes 238
T. Arun Prasanna, K. Vaithianathan
50. Prevalence of Lifestyle Related Risk Factors for Non-communicable Diseases among Adolescents of an Urban Community in Mumbai 242
Joshi Bhavna Pramod, Tayade Deepak Narayan
51. Role of Curcumin in Chemoprevention of Oral Cancer: A Review 248
Yogesh Chhparwal, Shubha Chhparwal, Navin Patil
52. Breast Feeding Practices-An Exploratory Survey among Mothers of Infants 253
Mamatha Shivananda Pai, Binu Margaret E, Yashoda S, Sheela Shetty
53. Comparative Study to Assess the Stress of Mothers of Preterm and Low Birth Weight Baby Admitted in NICU vs Postnatal Ward 258
Violin Sheeba, T. Radha Bai Prabu
54. Eat Out Habits of Individuals With Reference to Ernakulam Metro City 261
A. S. Ambily
55. Women's Health in Midlife: Factors Influencing Menopausal Symptoms among Rural Women in Tiruvallur District of Tamilnadu 266
Ruma Dutta, Pankaj Shah, Shanthi Edward, Anitha Rani, Dinesh Raja, Timsi Jain
56. Review of Burden of Risk Factors of Coronary Heart Disease in India 272
Meenakshi Khapre, Vartika Saxena
57. Horizontal Ridge Augmentation Using Ridge Expansion Technique Followed by Implant Placement ... 276
Gayathri Krishnamoorthy, Nayana Prabhu, Vidhi Goyal, Srikanth
58. Services of Untouchability in the Sacred Complex of Lingaraj Temple 281
P. Sreeja, Jagannath Dash, R. Vinoth
59. Harnessing the Differentiated Model of HIV-AIDS Care as an Enabling Factor for Successful HIV-AIDS Programme Management 288
Shayhana Ganesh
60. Can Artificial Intelligence be Used as an Enabler for Anti-Retro-Viral Medication Adherence in HIV-AIDS Management Programmes? 290
Shayhana Ganesh

61. Recommendations for HIV-AIDS Programme Management Indicator Development	293
<i>Shayhana Ganesh</i>	
62. Prospective Lung Transplantation in Indonesia: Lung Donor Preparation, Preservation, and Allocation	296
<i>Zulkifli Amin; Sari PurnamaHidayat</i>	
63. Factors Causing Infant Mortality in Surabaya	301
<i>Wahyu Gito Putro</i>	
64. The Association between Short Nap and Memory Performance Using Concise Learning Method and Logical Learning Method among Private University Students in Selangor, Malaysia	305
<i>Mustafa Fadil Mohammed, Mohammed A. Abdalqader, Mohammed Abdelfatah Alhoot, Mohanad R. Alwan, Mohammed FaezAbobakr, Asha Binti Abd. Rahman</i>	
65. Swimming Skill Development among Rural Children Under Limited Infrastructure: The Stakeholders' Perspectives	311
<i>Orapin Laosee, Ratana Somrongthong</i>	
66. Personality, Perceived about Co-workers Safety Behavior and Unsafe Acts in Construction Workers ...	316
<i>Noorce Christiani Berek, Qomariyatus Sholihah</i>	
67. Determinant Factors of Work Stress among Teaching and Non Teaching Staff in Indonesia	321
<i>Ratih Damayanti, Erwin Dyah Nawawinetu</i>	
68. Measurement of Radon Concentration in the Soil of Some Areas of the City of Shatrah Using the Nuclear Impact Detector (Cr-39)	326
<i>Ibtihaj Ahmed kadhim</i>	
69. Immunoglobulins Levels in Iraqi Atopic patients (Asthma, Rhinitis and Urticaria)	332
<i>Salwa G. Turki, Suad A. Brakhas, Wesam H. Ahmed</i>	
70. Role of serum Leptin and Prolactin in Iraqi females' patients with Rheumatoid Arthritis	337
<i>Abbas Toma Joda</i>	
71. Peroxisome Proliferator Activated Receptor (PPAR) Delta Genetic Polymorphism in Saudi Normal Population	343
<i>Abdulraheem A. Almalki, Khalaf F. Alsharif, Osama M. Al-Amer, AbdulAziz A. Almalki, Ahmed S. Abdel-Moneim</i>	
72. Spiritual Resilience Model on Drug Abuse Intensity among Senior High School Students, South Kalimantan: A Path Analysis	348
<i>Syamsul Firdaus, Anggi Setyowati, Endang Sri Purwatiningsih</i>	
73. The Effect of Given Information, Knowledge and Community Participation of Family Planning Village Programs in East Java Province-Indonesia	354
<i>Annisa Ullya Rasyida, Iswari Hariastuti, Kuntoro, Haryono Suyono, Sri Widati</i>	
74. Effect of Bone Morphogenetic Protein-4 on the Expression of BMP-7In Bone Repair	359
<i>Athraa Y. Al-Hijazi, Abdul Karim A Al-Mahammadawy, Imad K. Abbas Al-Rifae, Basim M Khashman, Alaa Wael Izzat</i>	
75. Measuring <i>Escherichia coli</i> in foods and Beverages towards Certification of Cafeteria in Campus	364
<i>Dewi Susanna, Yvonne M. Indrawani, Zakianis, Tris Eryando, Aria Kusuma</i>	

76.Deleted.....	367
77. Spousal Communication on Family Planning and Contraceptive Adoption in Indonesia	372
<i>Dian Kristiani Irawaty, Hadi Pratomo</i>	
78. Epidemiology Character of Tuberculosis among Internally Displaced Persons in Tikrit City	377
<i>Athraa Essa Ahmed, Azeez Mohammed Ali Azeez</i>	
79. The Relation of Physical Air Quality and Occupancy Density with the Existence of <i>Streptococcus sp</i> Bacteria in Air at Sarijadi Urban Village Sub district of Bandung	382
<i>Elanda Fikri, Novita Sekar Ayu Prabono, Pujiono</i>	
80. The Policy of Reproductive Health Education for the Adolescence with Intellectual Disability in Indonesia: A Qualitative Study	387
<i>Dhefi Ratnawati, Evi Martha, Sela Fasya</i>	
81. Artificial UV Radiations Emitted from Different Types of Lamps	392
<i>Fadhil Khaddam Fuliful, Adnan M. Mansoor Al-Saeedi, Hind K. Abbas</i>	
82. Accuracy of Ultrasound in Comparison to Magnatic Resonance Imaging in Diagnosis of Meniscal Tears	397
<i>Mahmoud Khudair Yaseen, Faiq I. Gorial</i>	
83. The Different Intake of Energy and Macronutrient on Weekdays and Weekend among Adolescent in Urban City	401
<i>Syafira Kandinasti, Farapti Farapti</i>	
84. Factors Affecting Waiting Time for Outpatient Medical Record Documents in General Hospital Dr. H. Moch. Ansari Saleh Banjarmasin	407
<i>Febriyanti, Achmad Rofi'i, Bahrul Ilmi, Husaini, Meitria Syahadatina Noor</i>	
85. The Presence of Lead in Blood of Pregnant Women at the First Trimester in Al Najaf City–Iraq	412
<i>Fulath Abdul-Redah Muhsin</i>	
86. Knowledge, Attitude and Practice of Relapse Malaria Patients. a Cross Sectional Study from Mandailing Natal District, Indonesia	416
<i>Nelson Tanjung, Mido Ester J Sitorus, Risnawati Tanjung, Haripin Togap Sinaga</i>	
87. Effect of Adding Different Levels of Green Tea Powder <i>Camellia Sinensis</i> to Diet on Some Physiological Traits in Broiler	420
<i>Khawla A. Salman, Sunbul J. Hamodi, Luma K. Al-Bandr</i>	
88. The Prevalence of Cesarean Section in Misan Province and It's Indicating Factors	425
<i>Saba Jassim Alheshimi, Aqeela Hayder Majeed, Kawakeb N Abdulla, Hiba Ali Rassme, Nawras Khairi Fadhil, Hayder Adnan Fawzi</i>	
89. Role of Diffusion-Weighted MRI and Dynamic Contrast-Enhanced MRI in Early Staging of Bladder Cancer	431
<i>Mohammed Abd-Kadhim, Mohammad Abd-Alrida Hussein, Hayder Adnan Fawzi</i>	
90. Effect of Gender on Difficulties in Laparoscopic Cholecystectomy	437
<i>Wisam Mahmood Aziz</i>	

91. Effects of Empowerment and Work Environment on Job Satisfaction of Nurse-midwives working in Hospitals 441
Sun Ok Lee, Hee Kyung Kim, Jung Suk Park
92. Effectiveness of the Smoking Stop Model to Improve the Rehabilitative Behavior of Adolescent Smokers 446
Heni Nurhaeni, Suryati Badrin
93. Family Support and Activities of Elderly with Hypertension in the Working Area of Mangasa Public Health Center, Makassar City, Indonesia 449
Ramlah, Bahtiar
94. SITRUST App: Detecting TB Cases and Increasing RMT Utilization in the Healthcare Facilities in East Java 453
Satiti Palupi¹, Zaimah², Siti Murtini³, M. Atoillah⁴
95. Adherence to the National Immunization Schedule for the First Year of Life in Misan, Iraq 459
Esraa Abd Al-Muhsen Ali, Hussein Fadhil Musa Aljawadi
96. Personal Factors that Affect Adherence of Fluid Restriction in Patient with Hemodialysis 465
Ika Yuni Widyawati, Nursalam, Kusnanto, Rachmat Hargono
97. Shift Work and the Risk of Cancer—A Systematic Review 471
Yulaida Maya Sari, Baiduri Widanarko
98. Analysis of Peripheral Neuropathy Disorders in Humans from Mercury Exposure: A Systematic Review 476
Ummul Hairat, Budi Hartono
99. Accident Compensation and Disability Cash Compensation Utilization of Workers with Disabilities due to an Accident 482
Indriati Paskarini, Tri Martiana, Tjipto Suwandi, Firman Suryadi Rahman
100. Use of Monitoring Cards to Increase Iron Substance and Hemoglobin Levels in Pregnant Women 487
Darmayanti, M. Mukhtar, A. Rizani, Tut Barkinah, Mahpolah, Mahdalena
101. The Gamma Nail Versus DHS in the Treatments of Intertrochanteric Fractures 492
Wejdi A. Al –Fatlawy
102. Detection Enteric Viral in the Newborn Causes Diarrhea in Al-Zahraa Hospital of Al-Najaf Government 497
Ihasan Adnan Hashim, Mohammed Abdulrazzaq Assi, Hayder Ali Muhammed
103. Effectiveness of Video Assisted Teaching Programme on Toilet Training of Toddlers among Parents in a Selected Rural Area in Shimla, Himachal Pradesh, India 502
Jinu K. Rajan
104. *Ex vivo* Cytopathic Effect Study of Human *Acanthamoeba keratitis* and Use of *E. coli* in Parasitic Culture 508
Mohenned A. Alsaadawi, Naer Alkaabi, Sura Alkhuzai, Simon Kilvington
105. Teacher’s Perception of Stakeholder Support in the Peer Education Program about Drug Abuse Prevention 514
Ira Nurmala, Elisa Dwi P, Muthmainnah, Riris Diana R
106. Functional Analysis of Beta 2 Microglobulin Protein in Patients with Prostate Cancer Using Bioinformatics Methods 519
Ammar Adil Jasim, Abbas Abdullah Mohammed, Ali Abdulhafidh Ibrahim
107. Use of Bipolar Cautery in Thyroidectomy 524
Khalid k. Hussein

The Different Intake of Energy and Macronutrient on Weekdays and Weekend among Adolescent in Urban City

Syafira Kandinasti¹, Farapti Farapti²

¹Faculty of Public Health, ²Lecturer in Department of Nutrition, Faculty of Public Health, Universitas Airlangga, Campus C Mulyorejo, Surabaya-Indonesia

ABSTRACT

Background: Prevalence of over nutrition in adolescents has increased every year in the world. Over nutrition in adolescents can impact on metabolic syndrome, mental health problems, and decreased academic achievement. Over nutrition caused by various factors including food intake. During weekends some people use more time to relax and not control their food intake. Increasing food intake on weekends contributed to cause an increasing body weight at the weekends.

Objective: To analyze the differences energy and macro nutrient intake during weekdays and weekends in adolescents.

Method: The design of this study was cross sectional on students of senior high school aged 16-18 years with total sample was 82 people. Data were obtained using a recall questionnaire to determine food intake and anthropometric measurements of weight and height to determine the nutritional status.

Results: In boys and girls there is an increasing of energy and macro nutrients intake on weekends compared to weekdays. A total of 46 students were gain their body weight on the weekend. In girls energy intake increased 35.04 kcal, carbohydrate 11.82 grams, fat 0.03 grams and protein 3.15 grams. Whereas in boys energy intake increased 34.33 kcal, carbohydrate 11.02 grams, fat 10.25 grams and protein 2.85 grams. The average weight gain in girls was 0.35 kg and 0.31 in boys. Adolescent with the increased of energy intake on weekend risked higher 4.133 to gain the body weight on weekend day

Conclusion: To prevent weight gain and over nutrition, adolescents better to pay attention of their food intake on weekends both in terms of quantity and quality.

Keywords: macronutrient, obesity, weekend, weekdays

INTRODUCTION

Obesity was a condition that caused a negative effect on health. In the world obesity more common in women with a prevalence 15% and men 11%.¹ Adolescent female had more risk of obesity than adolescent male. Adolescent female saved more excessive energy as stored fat, while adolescent male use excessive energy to synthesize protein. When physical maturity occurs, the

number of body fat in adolescent female usually twice more than adolescent male. This accumulation fat occurs in the area around the pelvis, breasts, and upper arms.²

Obesity adolescents with BMI above 95 percentile had greater risk of emotional stress compared to their peer who have normal status. Obesity and overweight in adolescents had an impact on the occurrence of metabolic syndrome problems, mental health, and decrease in academic achievement.^{3,4,5} Adolescents obese who had a few friends were more likely to isolate themselves from their social environment and had higher risk of depression than normal adolescents.⁶

The NHANES (National Health and Nutrition Examination Survey) data from 2001-2004 and 2009-2012 showed that there was an increased prevalence

Corresponding Author:

Farapti Farapti
Lecturer in Department of Nutrition
Faculty of Public Health, Universitas Airlangga
Campus C Mulyorejo 60115, Surabaya-Indonesia
Email: farapti@fkm.unair.ac.id

of over nutrition in children and adolescents aged 2-19 years in United State and Canada from 16.6% to 17.5% and from 12.4% to 13%.^{7,8} In Indonesia based on data from the Basic Health Research in 2013 found that prevalence of adolescents with over nutrition aged 16-18 years was 7.3% and prevalence in east java was 8.2%.⁹ This research was conducted at 5 Senior High School in Surabaya because in the previous research study showed a percentage of students who were overweight was 33.1% and obese 8.9%, this percentage value exceeds the value of Province.¹⁰

Obesity is influenced by many factors, including factors genetic, energy intake, physical activity, environmental and emotional.^{11,12} In several literature studies shown that in adolescents male and female there was an increased in energy and macro nutrients intake on weekends compared to weekdays. Longitudinal studies conducted in the United States using NHANES survey data showed that at the weekend the average of total energy intake increased 82 calories higher than weekdays.¹³ Protein intake in girls was 10-15% higher on weekends than in weekdays and boys' average protein intake also increased at the weekend. On weekends the average of fat intake for boys was 7-15% higher and in women increases more than 20% compared to weekdays. Whereas carbohydrate intake for girls was increased 12-15% and boys 7% on weekend compared to weekdays.¹⁴

Longitudinal studies in the United States divided subjects into reducing calories group and increasing physical activity group showed that there was an increases of energy intake and body weight 0.077 kg per week. Although relatively small increasing but could have an impact of 4 kg increases in one year if the pattern of increased food intake on weekend continued.¹⁵ The purpose of this study was to analyze the differences of energy and macronutrients intake during weekdays and weekends in adolescents who live in urban areas.

METHOD

This study was an observational study with cross sectional study design. The location of the study was at 5 Senior High School in Surabaya. The study population was adolescents aged 16-18 years both male and female. This study was performed in April - September 2018. Students who were willing to take part in the study will be measured anthropometry body weight using digital scales with a precision level of 0.1 kg, height measurements using a stadiometer with a precision level of 0.1 cm, and filling questionnaires characteristic data. Body weight was measured in morning before starting studied in 3 times. The study didnot conducted during the exam period, students who were athletes and who still programming diet will be excluded from this study. The number of samples in the study was 82 students and randomly selected. Respondents' food intakes weremeasured using food recall 24 hours in 4 times that ware 2 times on weekdays and 2 times on weekend. Food recall data will process using the Nutrisurvey application to determine the amount of energy, carbohydrate, fat, and protein intake. Then the average energy and macronutrients intake on weekdays will be compare to weekend. While the nutritional status of respondents was determined using application of WHO Anthro Plus for aged 6 to 18 using weight, height, and respondent date of birth data.

RESULTS

From the results of the study on 82 respondents in 5 Senior High School Surabaya, the distribution of nutritional status of respondents who were classified as underweight was 2.4%, normal 69.5%, overweight 9.8% and obesity 18.3%. Table 1 told about the characteristic of respondents showed that most of respondents were in class XI (65.9%), the average age of respondents was 16.33 ± 0.47 years and male adolescent got more average pocket money (Rp. 23094) than female (Rp. 21740).

Table 1: Characteristic of subjects

Variable	Male (n = 32) Mean \pm SD	Female (n = 50) Mean \pm SD	Total (n = 82)
Aged	16.38 \pm 0.49	16.30 \pm 0.46	16.33 \pm 0.47
Class			
XI	20	34	65.9%
XII	12	16	34.1%
Pocket money	23093.75 \pm 11453.58	21740 \pm 14688.34	22.268.29 \pm 13.459.63

Conted...

Nutrition Status			
> 1SD	19	40	72%
≤1 SD	13	10	28%
Physical activities (met)			
Heavy	5	7	14.6%
Light - moderate	27	43	85.4%

Table 2: Energy and macro nutrient intake on weekdays and weekend

Food Intake	Male (n = 32) Mean ± SD	Female (n = 50) Mean ± SD	Total (n = 82)
Weekdays			
Energy (kcal/day)	2035.96 ± 141.43	1888.60 ± 115.78	1946.11 ± 144.89
carbohydrate (gr/day)	229.61 ± 23.89	212.68 ± 29.77	219.29 ± 18.49
Fat (gr/day)	88.05 ± 14.06	81.71 ± 15.13	84.18 ± 14.35
Protein (g/day)	78.17 ± 13.48	77.19 ± 16.71	77.57 ± 15.45
Body weight	66,21 ± 16,26	54,57 ± 13,43	59.11 ± 15.58
Weekend			
Energy (kcal/day)	2070.29 ± 161.10	1923.64 ± 146.19	1980.87 ± 167.46
carbohydrate (gr/day)	240.63 ± 31.92	224.49 ± 33.85	230.79 ± 33.85
Fat (gr/day)	85.19 ± 14.06	78.56 ± 15.13	81.15 ± 14.98
Protein (g/day)	88.42 ± 26.03	77.16 ± 11.28	81.55 ± 2.11
Body weight	66,45 ± 16,28	54,66 ± 13,50	59.26 ± 15.66
Difference in food intake			
Energy (kcal/day)	34.33 ± 131.60	35.04 ± 132.35	34.76 ± 131.24
carbohydrate (gr/day)	11.02 ± 41.77	11.82 ± 46.88	11.51 ± 44.69
Fat (gr/day)	10.25 ± 30.55	-0.03 ± 20.81	3.98 ± 25.39
Protein (g/day)	-2.85 ± 13.57	-3.15 ± 21.01	-3.03 ± 18.36
Body weight	0,31 ± 0,16	0,35 ± 0,17	0,15 ± 0,36

Table 2 showed that there were differences in energy and macronutrients intake both in male and female adolescent on weekdays and weekends. Overall, the average male adolescent intake was significantly higher than female adolescent, except for protein intake during weekdays. However, it was found that there was no significant difference in changes of food intake between weekdays and weekends in male and female adolescent.

Table 3: The different of energy and macro nutrient intake between weekdays and weekend and the association with weight gain

The difference of food intake	Weight Gain	Constant or weight loss	P value	OR
	n (46)	n (36)		
Energy				
Increased	40	5	0.002*	4.133
Decreased	6	31		
Carbohydrate				
Increased	30	22	0.702	1.193
Decreased	16	14		

Conted...

Fat				
Increased	22	12	0.186	1.833
Decreased	24	24		
Protein				
Increased	27	16	0.200	1.776
Decreased	19	20		

chi-square test *significant, $p < 0.05$

Based on table 3 showed that there was a significant association between increasing energy intake and weight gain on weekends with p value score 0.002 and odds ratio 4.133, it means that respondents who increased intake of energy on weekend 4.133 risked gained their weight on weekends.

DISCUSSION

Carbohydrate, fat and protein nutrients were source of energy for the body that was needed for daily activities.¹⁶ Consumption excessive macronutrient will be stored in form fat reserves. Excessive accumulation of fat in fat tissue causes individuals being over nutrition. The prevalence of overnutrition(overweight and obesity)in this study was 28% that occur in 20% of female adolescent and 40.6% of male adolescent.The results showed that in adolescent male and female during weekdays there were significant differences in energy, carbohydrate and fat intake.However, on weekend energy and all of macronutrient intake were significant difference. When energy intake greater than the energy released, it causes energy imbalances in the body and can be impact to an increase of body fat mass.¹⁷

The results of this study show that there was an increased energy intake on weekend both in adolescent male and female with an average increased 35.05 kcal in adolescent female and 34.33 in adolescent male. This was in line with the cross-sectional study in children aged 10 years and over, who showed that intake of energy on weekend increased 8% compared to energy intake during weekdays.¹⁸nutrients, and food groups intake between days of the week and weekend days in the Brazilian population. METHODS We used data from the first National Food Survey (2008-2009 Longitudinal studies conducted in America also stated that the average intake energy on weekend increased 82 calories higher than weekdays.¹³

Carbohydrates were the main energy source for the body. Excessive carbohydrate intake will be stored in form of glycogen in liver and muscle tissue, and some of it will be converted into fat and stored in fat tissue.¹⁶ In this study there was an increases carbohydrate intake on weekend 11.82 grams in female adolescent and 11.02 grams in male adolescent. In line with longitudinal studies conducted in high school student in Netherlands stated that carbohydrate intake of female adolescent was 12-15% higher on weekends, while male adolescent increased 7% higher. In male adolescent, carbohydrate intake increases with age, whereas in women decrease with increasing age.¹⁴ In addition, research in Brazil also stated that the contribution of carbohydrates to daily energy intake on average 4% lower on weekdays than on weekends.¹⁸nutrients, and food groups intake between days of the week and weekend days in the Brazilian population. METHODS We used data from the first National Food Survey (2008-2009

Excessive accumulation of fat in fat tissue causes individuals being over nutrition. In this study the average fat intake on weekends increased 3.15 grams in female adolescent and 2.85 grams in male adolescent. Longitudinal research in adolescent high school students in the Netherlands stated that compared to fat intake during weekdays the average fat intake on weekends increased 7-15% in male adolescent and increased more than 20% in female adolescent.¹⁴ In addition, cross sectional studies in Brazil also showed a higher percentage of total fat, saturated fat and trans fat intake on weekends than weekdays. In this study showed that in female adolescent increased of fat intake on the weekend had relation with body weight gain.

Protein was a nutrient that has various important functions in the growth and maintenance of body cells, hormone formation, regulating water balance, antibody formation, transporting nutrients, and energy

sources.¹⁶ Excessive protein intake will stored in form of triglycerides and can causes an increased fat tissue which affected to nutritional status.¹⁹ The results of this study showed that the average protein intake at the weekend increased 0.03 grams in female adolescent and 10.25 grams in male adolescent. Longitudinal studies in high school student in Netherlands school also stated that female adolescent have 10-15% higher protein intakes on weekends than on weekdays. Whereas in male adolescent also showed a high average protein intake on weekends. Both on weekdays and weekends, animal protein intake twice more consumed than protein intake from vegetable sources.¹⁴

In this study, 46 of students gain their body weight over the weekend. Compare to weekdays the average of body weight at the weekend increased 0.35 kg in female adolescent and 0.31 in male adolescent. According to McCarthy, a consistently increase in food intake every weekend has a significant impact on body weight for one year. An increases of 100 kcal every weekend for a year causes an increases 2 kg of body weight which contributes to an increasing the prevalence of overweight and obesity.²⁰ Longitudinal studies in America also showed an increases 0.077 kg in body weight on weekend. Even though it was small, but it has an impact of 4 kg increased body weight in one year if the pattern of increasing intake on weekend continues.¹⁵ This study showed that increasing intake of energy and macronutrients on weekend had an effect on weight gained. Adolescent with the increased of energy intake on weekend risked higher 4.133 to gain the body weight on weekend day

CONCLUSION

The result of this study was 28% of respondents were classified as having nutritional status overweight and obesity. Both male and female adolescents had increased energy and macronutrients intake on weekends compared to weekdays. A total of 46 student in this study gained their weight on weekend. Adolescent who increased their intake of energy on weekend 4.133 risked gained their weight on weekend. Adolescents better to pay attention of their quantity and quality food intake on weekends to prevent being over nutrition, and needed further research to see how it relates to gaining weight.

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