



RS Global

WORLD SCIENCE

Special Edition
May 15-16, 2019

**VI Ukrainian Scientific Conference
of Students and Young Scientists in Physiology
«Physiology to Medicine, Pharmacy and Pedagogics:
Actual Problems and Modern Advancements»**

DOI: https://doi.org/10.31435/rsglobal_ws

Copies may be made only from legally acquired originals.

A single copy of one article per issue may be downloaded for personal use (non-commercial research or private study). Downloading or printing multiple copies is not permitted. Electronic Storage or Usage Permission of the Publisher is required to store or use electronically any material contained in this work, including any chapter or part of a chapter. Permission of the Publisher is required for all other derivative works, including compilations and translations. Except as outlined above, no part of this work may be reproduced, stored in a retrieval system or transmitted in any form or by any means without prior written permission of the Publisher.

Publisher –
RS Global Sp. z O.O.,
Scientific Educational Center
Warsaw, Poland
Numer KRS: 0000672864
REGON: 367026200
NIP: 5213776394

Publisher Office's address:
Dolna 17, lok. A_02
Warsaw, Poland,
00-773
Website: <https://ws-conference.com/>
E-mail: rsglobal.poland@gmail.com
Tel: +4(857) 898 55 10

The authors are fully responsible for the facts mentioned in the articles. The opinions of the authors may not always coincide with the editorial boards point of view and impose no obligations on it.

CHIEF EDITOR

Laputyn Roman PhD in transport systems, Associate Professor, Department of Transport Systems and Road Safety, National Transport University, Ukraine

EDITORIAL BOARD:

Nobanee Haitham Associate Professor of Finance, Abu Dhabi University, United Arab Emirates

Almazari Ahmad Professor in Financial Management, King Saud University-Kingdom of Saudi Arabia, Saudi Arabia

Lina Anastassova Full Professor in Marketing, Burgas Free University, Bulgaria

Mikiashvili Nino Professor in Econometrics and Macroeconomics, Ivane Javakishvili Tbilisi State University, Georgia

Alkhawaldeh Abdullah Professor in Financial Philosophy, Hashemite University, Jordan

Mendebaev Toktamys Doctor of Technical Sciences, Professor, LLP "Scientific innovation center "Almas", Kazakhstan

Yakovenko Nataliya Professor, Doctor of Geography, Ivanovo State University, Shuya

Mazbayev Ordenbek Doctor of Geographical Sciences, Professor of Tourism, Eurasian National University named after L.N.Gumilev, Kazakhstan

Sentyabrev Nikolay Professor, Doctor of Sciences, Volgograd State Academy of Physical Education, Russia

Ustenova Gulbaram Director of Education Department of the Pharmacy, Doctor of Pharmaceutical Science, Kazakh National Medical University name of Asfendiyarov, Kazakhstan

Harlamova Julia Professor, Moscow State University of Railway Transport, Russia

Kalinina Irina Professor of Chair of Medicobiological Bases of Physical Culture and Sport, Dr. Sci.Biol., FGBOU VPO Sibirsky State University of Physical Culture and Sport, Russia

Imangazinov Sagit Director, Ph.D. Pavlodar affiliated branch "SMU of Semei city", Kazakhstan

Dukhanina Irina Professor of Finance and Investment Chair, Doctor of Sciences, Moscow State Medical Dental University by A. I. Evdokimov of the Ministry of health of the Russian Federation, Russian Federation

Orehowskyi Wadym Head of the Department of Social and Human Sciences, Economics and Law, Doctor of Historical Sciences, Chernivtsi Trade-Economic Institute Kyiv National Trade and Economic University, Ukraine

Peshcherov Georgy Professor, Moscow State Regional University, Russia

Mustafin Muafik Professor, Doctor of Veterinary Science, Kostanay State University named after A. Baitursynov

Ovsyanik Olga Professor, Doctor of Psychological Science, Moscow State Regional University, Russian Federation

Suprun Elina Professor, Doctor of Medicine, National University of Pharmacy, Ukraine

Kuzmenkov Sergey Professor at the Department of Physics and Didactics of Physics, Candidate of Physico-mathematical Sciences, Doctor of Pedagogic Sciences, Kherson State University

Safarov Mahmatali Doctor Technical Science, Professor Academician Academia Science Republic of Tajikistan, National Studies University "Moscow Power Institute" in Dushanbe

Omarova Vera Professor, Ph.D., Pavlodar State Pedagogical Institute, Kazakhstan

Koziar Mykola Head of the Department, Doctor of Pedagogical Sciences, National University of Water Management and Nature Resources Use, Ukraine

Tatarintseva Nina Professor, Southern Federal University, Russia

Sidorovich Marina Candidate of Biological Sciences, Doctor of Pedagogical Sciences, Full Professor, Kherson State University

Polyakova Victoria Candidate of Pedagogical Sciences, Vladimir Regional Institute for Educational Development Name L. I. Novikova, Russia

Issakova Sabira Professor, Doctor of Philology, The Aktyubinsk regional state university of K. Zhubanov, Kazakhstan

Kolesnikova Galina Professor, Taganrog Institute of Management and Economics, Russia

Utebaliyeva Gulnara Doctor of Philological Science, Al-Farabi Kazakh National University, Kazakhstan

Uzilevsky Gennady Dr. of Science, Ph.D., Russian Academy of National Economy under the President of the Russian Federation, Russian Federation

Krokhmal Nataliia Professor, Ph.D. in Philosophy, National Pedagogical Dragomanov University, Ukraine

Chorny Oleksii D.Sc. (Eng.), Professor, Kremenchuk Mykhailo Ostrohradskyi National University

Pilipenko Oleg Head of Machine Design Fundamentals Department, Doctor of Technical Sciences, Chernigiv National Technological University, Ukraine

Nyyazbekova Kulanda Candidate of pedagogical sciences, Kazakhstan

Cheshmedzhieva Margarita Doctor of Law, South-West University "Neofit Rilski", Bulgaria

Svetlana Peneva MD, dental prosthetics, Medical University - Varna, Bulgaria

Rossikhin Vasily Full dr., Doctor of Legal Sciences, National Law University named after Yaroslav the Wise, Ukraine

Pikhtirova Alina PhD in Veterinary science, Sumy national agrarian university, Ukraine

Temirbekova Sulukhan Dr. Sc. of Biology, Professor, Federal State Scientific Institution All-Russia Selection-Technological Institute of Horticulture and Nursery, Russian Federation

Tsybaliuk Vitalii Professor, Doctor of Medicine, The State Institution Romodanov Neurosurgery Institute National Academy of Medical Sciences of Ukraine

CONTENTS

Chernobay L., Vasylieva O., Lenska O., Morozov O., Terentyev V. TO THE ISSUE OF THE MECHANISM OF ADAPTATION DEVELOPMENT TO THE PSYCHOEMOTIONAL STRESS OF TRAINING IN FEMALE MEDICAL STUDENTS OF GENERAL AND SPORTS GROUPS.....	5
Goncharova A. V., Pavlov S. B., Pavlova O. S., Razumovskiy A. N., Kaur A. ADAPTABILITY OF CARDIORESPIRATORY SYSTEM IN NORMOTENSIVE AND HYPOTENSIVE FEMALE STUDENTS WITH DIFFERENT IMPACT OF THE AUTONOMIC NERVOUS SYSTEM SUBDIVISIONS.....	8
Nataliia S. Hloba, Inna M. Isaieva, Irina S. Karmazina, Dmytro I. Marakushin, Oleksandr A. Hloba THE INTERCONNECTION BETWEEN INDIVIDUAL CIRCADIAN RHYTHMS AND EATING BEHAVIOR AS ONE OF MAIN REASONS OF OVERWEIGHT AND OBESITY IN YOUNG PEOPLE.....	12
Maslova N., Maslova Y. RESEARCH OF THE DENTAL STATUS OF MEDICAL UNIVERSITY STUDENTS.....	16
Pandikidis N. I., Stovan A. O. INFLUENCE OF THE ENVIRONMENTAL FACTORS ON THE HUMAN DIABETES.....	18
Alekseienko R. V., Rysovana L. M. THE INFLUENCE OF NATURAL AND SOCIAL FACTORS ON THE VITAL ACTIVITY OF THE ORGANISM IN MODERN CONDITIONS.....	21
Bulynina Oksana, Voytenko Taisiya THE EMPATHIC ABILITY OF KHARKIV NATIONAL MEDICAL UNIVERSITY STUDENTS WITH THE FUNCTIONAL ASYMMETRY OF A DIFFERENT TYPE.....	24
Nadiia V. Hryhorenko, Marina S. Zimina, Stanislav M. Zimin, Maryna N. Kucher PHYSICAL AND CHEMICAL PROPERTIES OF BILE IN DIABETIC PATIENTS.....	28
Dunaeva O. V., Korovina L. D. THE DEPENDENCE OF THE DEGREE OF METEOSENSITIVITY ON THE STATE OF THE CARDIORESPIRATORY SYSTEM AND THE PRESENCE OF PREPATHOLOGICAL CHANGES IN THE BODY IN MEN AND WOMEN.....	32
Dmytro I. Marakushyn, Inna M. Isaieva, Iryna S. Karmazina, Natalia S. Hloba, Elijah Adetunji Oluwasegun, Kateryna M. Makarova FEMALE VS. MALE: DIFFERENCE IN IMMUNE RESPONSE.....	35
Kyrychenko M. P., Marakushin D. I., Shenher S. V., Dunaeva O. V., Bondar O. O. SOME FEATURES OF THE EYE TEST IN PERSONS WHO ARE SYSTEMATICALLY INVOLVED IN SPORTS.....	38
Sokol O. M., Polishchuk T. V., Khorshunova A. M., Kadnai O. S., Volkov I. I. CORRELATES OF AUTONOMOUS NERVOUS AND IMMUNE SYSTEMS AT INTELLECTUAL EXERTION OF MEDICAL STUDENTS IN CONDITIONS OF COMBINED ACTION OF ENVIRONMENTAL STRESSORS.....	40
Hanna M. Zelinskaya, Katerina A. Zelenskaya, Sukhachova I. A., Kovalenko A. A., Yuliya G. Bazyleva FEATURES OF ADAPTATION REACTIONS OF ORGANISM OF STUDENTS, WHICH DEPEND ON THE PRESENCE OF CHRONIC DISEASES IN ANAMNESIS.....	43
Tishchenko A. N., Lisina A. V., Yurkova O. V., Tishchenko M. O. CERTAIN ASPECTS OF ADAPTOLOGICAL INFLUENCES ON THE DEVELOPMENT OF PSYCHOPHYSIOLOGICAL ADDICTION.....	47
Shtrakh Kateryna Vasyliivna, Rak Larisa Ivanivna, Mulenga Natasha, Samuel Arko Addo, Okoronkwo Ugochukwu, Innocentia Awuzie CORRELATION OF STRESS-PROVIDING AND RENIN-ANGIOTENSIN-ALDOSTERONE SYSTEMS AND NT-PROBNP IN ADOLESCENTS WITH RHYTHM DISORDERS.....	49

<i>Маракушин Д. І., Ісаєва І. М., Кармазіна І. С., Глоба Н. С.</i> ВПЛИВ ОКСИЕТИЛЬОВАНИХ НОНІЛФЕНОЛІВ ТА ЇХ ПОХІДНИХ НА СТАН НЕСПЕЦИФІЧНОЇ ІМУННОЇ РЕЗИСТЕНТНОСТІ ЩУРІВ.....	54
<i>Л. М. Дяченко</i> ВІДПОВІДЬ КЛІТИН ЛЕЙКОЦИТАРНОГО РЯДУ НА ВПЛИВ СТРЕС-ФАКТОРІВ ТА МОЖЛИВІСТЬ ЇЇ КОРЕЛЯЦІЇ ПРИРОДНИМИ АНТИОКСИДАНТАМИ.....	60
<i>Vaschuk Mykola A., Sokol Olena M., Khorshunova Anastasiy M., Chernysh Hanna O., Yacenko Alina Yu.</i> ADAPTATION INDEX AND FUNCTIONAL STATE OF CENTRAL NERVOUS SYSTEM IN MEDICAL STUDENTS DURING THE PERIOD OF INTENSIVE LEARNING ACTIVITY.....	67
<i>Ковальов М. М., Чеботенко О. Р.</i> ЯВИЩЕ ЕМПАТІЇ ЯК СПОСІБ АДАПТАЦІЇ ТА ВЗАЄМОДІЇ В СОЦІАЛЬНІЙ СФЕРІ.....	70

ADAPTABILITY OF CARDIORESPIRATORY SYSTEM IN NORMOTENSIVE AND HYPOTENSIVE FEMALE STUDENTS WITH DIFFERENT IMPACT OF THE AUTONOMIC NERVOUS SYSTEM SUBDIVISIONS

PhD Goncharova A. V., PhD, DSc in Biology Pavlov S. B., MD Pavlova O. S.,
MD Razumovskiy A. N., Kaur A.

Ukraine, Kharkiv, Kharkiv National Medical University,
Kharkiv Medical Academy of Postgraduate Education,
Center for Emergency and Disaster Medicine

DOI: https://doi.org/10.31435/rsglobal_ws/16052019/6423

ARTICLE INFO

Received: 20 March 2019
Accepted: 17 April 2019
Published: 16 May 2019

KEYWORDS

adaptability,
autonomic regulation,
blood pressure,
cardiorespiratory system,
hypotension.

ABSTRACT

It was carried out the analysis of the body adaptability in the situation of training loads stress in students with normotension and hypotension and predominance of different types of autonomic nervous system regulatory influence on the cardiorespiratory system. In 103 second-year female students of KNMU systolic, diastolic blood pressure, pulse pressure, heart rate were measured, the Kerdo index and the Robinson index were determined. Functional breathing tests with breathing delay on the inhalation (Stange) and on the exhalation (Genchi) were conducted. They are the indicators of the cardiorespiratory system functional state and sensitivity to a decrease of oxygen saturation in arterial blood (hypoxemia) and carbon dioxide increase in blood (hypercapnia). Psycho-emotional stress in second-year female students causes a deficiency in the body adaptation reserves. Formation of adapting to learning stress is carried out at the limit of the functional capabilities of the body and may lead to a breakdown of adaptation

Citation: Goncharova A. V., Pavlov S. B., Pavlova O. S., Razumovskiy A. N., Kaur A. (2019) Adaptability of Cardiorespiratory System in Normotensive and Hypotensive Female Students with Different Impact of the Autonomic Nervous System Subdivisions. *World Science. Special Edition. VI Ukrainian Scientific Conference of Students and Young Scientists in Physiology «Physiology to Medicine, Pharmacy and Pedagogics: Actual Problems and Modern Advancements»* doi: 10.31435/rsglobal_ws/16052019/6423

Copyright: © 2019 Goncharova A. V., Pavlov S. B., Pavlova O. S., Razumovskiy A. N., Kaur A. This is an open-access article distributed under the terms of the **Creative Commons Attribution License (CC BY)**. The use, distribution or reproduction in other forums is permitted, provided the original author(s) or licensor are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.

Recently, the attention of researchers is once again attracted by the role of autonomic regulation providing the adaptive capabilities of the cardiorespiratory system, and especially among young people [1-3].

The period of studying at university is indicative in the regard of regulatory mechanisms reserves functioning, since studying workloads are turning out to be a factor of adaptation mechanisms stress. The second year of studying characterizes the period when the process of formation of adaptation to academic loads went through the stage of activation of nonspecific adaptation mechanisms and was replaced by the stage of activation of specific ones. The basic system for ensuring adaptation processes is the cardiorespiratory functional system, the regulatory element of which is the autonomic nervous system. The latter coordinates the adaptation reactions of the body. But the result of compensatory-adaptive reactions also depends on the initial functional state of the organism. One of its indicators is blood pressure and the type of autonomic regulatory influence.

It is interesting to analyze the adaptability of the organism in a studying workloads stress situation in students with hypotension and predominance of different subdivisions of autonomic nervous system in cardiovascular system regulation.

The aim of the study was to investigate autonomic regulation of the body with normal and decreased blood pressure and different values of the vegetative index.

Materials and methods.

103 female students of the second year studying of the Kharkov National Medical University were examined. Structural-temporal parameters of the circulatory system were measured at rest — systolic blood pressure (SBP), diastolic blood pressure (DBP), pulse pressure (PP), heart rate (HR). Determination of vegetative Kerdo index (VKI) was carried out. Its calculation is as follows: $(1 - \text{DBP} / \text{HR}) \times 100$. In the Kerdo-index, positive values indicate the predominance of sympathetic subdivision of autonomic nervous system (sympathicotonia), and negative values indicate the increase of parasympathetic tone (parasympathicotonia). In full autonomic equilibrium (eutonia) in the cardiovascular system, $\text{VKI} = 0$. Also the level of metabolic and energy processes in the myocardium determination was carried out according to the Robinson Index (IR), which was calculated using the formula $\text{IR} = \text{HR} \times \text{SBP} / 100$. An IR of 69 or less indicates a high level of functional reserves of the cardiovascular system, 70-84 - a physiologically normal level, 85-94 - a low level of functional capabilities, 95-110 - an insufficient level and signs of cardiovascular system dysregulation, 111 and more - violation of regulation. Functional breathing tests with breathing delay on the inhalation (Stange) and on the exhalation (Genchi) were conducted. They are the indicators of the cardiorespiratory system functional state and sensitivity to a decrease in oxygen saturation of arterial blood (hypoxemia) and increase of carbon dioxide in blood (hypercapnia). Normally, the duration of the Stange test is 40-60 s, the Genchi test is 20-40 s.

According to the study of all indicators of blood pressure, the students were divided into two groups: normotensive (40 stud.) and hypotensive (63 stud.). In each group, on the basis of the VKI, students were identified as students with parasympathicotonia (28 and 24 students, respectively), students with sympathicotonia (8 and 13 students, respectively) and students with eutonia (26 and 4 students, respectively). Thus, in order to identify various adaptive abilities in these groups, a comparative analysis of all studied parameters was carried out.

Statistical significance was assessed using parametric and non-parametric criteria. A critical level of significance was taken 0.05.

Results and Discussion.

An investigation of circulatory system parameters showed the following. In students of normotensive type with parasympathicotonia, a higher HR was observed in comparison with students of hypotensive type ($p < 0.05$) (Table 1). In the latter, the duration of the Stange test and the Genchi test was lower than the normal values - 40-60 s and 20-40 s, respectively, which indicates the organism instability to hypoxemia and hypercapnia. Although at the same time, in students of normotensive type, the average duration of breath holding during inhalation (Stange test) 37.96 ± 2.89 was close to the lower limit of normal range.

Table 1. Parameters of the cardiorespiratory system in students with parasympathicotonia

Groups	HR, 1/min	SBP, mm Hg	DBP, mm Hg	PP, mm Hg	Stange, s	Genchi, s	IR	VKI
Normotensive type	67,89± 1,28	119,11± 0,63	77,32± 0,83	42,14± 1,10	37,96± 2,89	23,36± 1,42	80,88± 1,61	-14,76± 2,13
Hypotensive type	62,58± 0,73*	96,25± 0,96	66,04± 0,60	30,21± 0,77	23,71± 1,24	19,29± 0,58*	60,35± 1,18	-5,69± 0,95*

* - $p < 0.05$ - in comparison with students of normotensive type

Also in the students of normotensive type the level of metabolic processes of providing myocardium with oxygen which is characterized with IR was 80.88 ± 1.61 . This is a low level of functioning of the cardiovascular system. And in students of hypotensive type, the IR was lower than 69, which characterizes a high level of functional reserves of the cardiovascular system. In this group,

students of normotensive type PP was higher in comparison with students of hypotensive type ($p < 0.01$), 10 of the 28 students of normotensive type had PP 45 mm Hg and higher.

In the group of hypotensive type students with eutonia a decrease in the duration of breath-holding on inspiration (Stange test) has been revealed ($p < 0.05$ compared to the group with normotensive) (Table 2). IR in students of normotensive type was increased in comparison with hypotensive. The values of IR in normotensive type students represented a low level of functional reserves of the cardiovascular system regulation, and the values of IR in students with hypotension showed a high level ($p < 0.01$). PP among normotensive students was higher than 40 mm Hg and higher compared to hypotensive ones. ($p < 0.01$).

Table 2. Parameters of the cardiorespiratory system in students with eutonia

Groups	HR, 1/min	SBP, mm Hg	DBP, mm Hg	PP, mm Hg	Stange, s	Genchi, s	IR	VKI
Normotensive type	75± 2,89	117,5± 2,5	75± 2,89	42,50± 4,79	42± 4,24	26,25± 6,79	88± 2,83	0
Hypotensive type	66,54± 0,67	100± 0*	66,54± 0,67	33,46± 0,67	24,23± 0,85*	19,38± 1,11	66,54± 0,67*	0

* - $p < 0.05$ - in comparison with students of normotensive type

Hypotensive students with sympathicotonia also had a low inspiratory breath hold time (Stange test) ($p < 0.05$ compared to the group with normotension), while such parameters of normotensive students were in the normal range (Table 3). In normotensive students the IR values were in the range of insufficient level of functional reserves of cardiovascular system regulation and demonstrated the signs of dysregulation. The IR values of hypotensive type students were of the high level range. The PP of normotensive students with sympathicotonia was higher than 40 mm Hg and higher compared with hypotensive students ($p < 0.05$).

Thus, according to the data presented in the study, regardless of the sympathetic-parasympathetic relationships, the hypotensive students showed a high level of myocardial metabolic processes, which was provided by a high sensitivity of the body tissues to hypoxia and hypercapnia.

In normotensive students in the group with eutonia, adequate sensitivity to hypoxia and hypercapnia is determined. The normotensive students of the other two groups — with sympathicotonia and parasympathicotonia — have a high sensitivity. Level of metabolic processes in the myocardium in the students with eutonia was low, in the group with sympathicotonia - insufficient, and the normal level of functional reserves of regulation of cardiac activity has been revealed only in the group with parasympathicotonia.

Table 3 Parameters of the cardiorespiratory system in students with sympathicotonia

Groups	HR, 1/min	SBP, mm Hg	DBP, mm Hg	PP, mm Hg	Stange, s	Genchi, s	IR	VKI
Normotensive type	80,5± 1,56	120± 1,34	73,13± 1,62	48,13± 1,88	43,81± 6,62	22,43± 2,15	96,68± 2,61	9,05± 1,86
Hypotensive type	67,38± 0,49	93,08± 0,92	61,54± 0,61	31,54± 0,82	27,15± 1,21*	18,77± 0,79	62,75± 0,87	8,62± 0,85

* - $p < 0.05$ - in comparison with students of normotensive type

It follows that the students of the normotensive type with different types of autonomic regulation demonstrated the different nature of the adaptive regulatory reactions providing. Thus, in students with parasympathicotonia with a physiologically normal myocardium oxygen supply level adaptation reactions are carried out due to the high tension of the functional oxygen transport system capabilities. This was reflected in high sensitivity to hypoxia, as well as high pulse pressure, which in turn may be a factor in the development of heart failure [4-5]. In students with eutonia and sympathicotonia, the sensitivity to hypoxia was adequate, however, the reduced functional reserves of the cardiovascular system were at the limit of physiological capabilities and could not provide a sufficient level of myocardial metabolic processes.

According to the IR data, the hypotensive type students with different activity of the autonomic nervous system subdivisions were characterized by a high level of reserve abilities of the cardiovascular system, which correlates with a high sensitivity of tissues to hypoxia and low pulse pressure, which, in our opinion, reflects the high tension of adaptation mechanisms. Therefore, the body adaptabilities of students are insufficient.

Conclusions. Psycho-emotional stress in a second year studying at the university causes a deficit of adaptive reserves of the body in students. Formation of adapting to learning stress is carried out at the limit of the functional capabilities of the organism and is body resource-intensive. This is a risk factor for the development of failure of adaptation and psychosomatic diseases in the dynamics of educational process.

REFERENCES

1. Botek M, Krejčí J and McKune A. Sex Differences in Autonomic Cardiac Control and Oxygen Saturation Response to Short-Term Normobaric Hypoxia and Following Recovery: Effect of Aerobic Fitness. *Front. Endocrinol.* 2018 9:697. doi: 10.3389/fendo.2018.00697.
2. Sasaki K, Maruyama R. Consciously controlled breathing decreases the high-frequency component of heart rate variability by inhibiting cardiac parasympathetic nerve activity. *Tohoku J Exp Med.* 2014 Jul; 233(3):155-63.
3. Sobiech T, Buchner T, Krzesiński P, Gielerak G. Cardiorespiratory coupling in young healthy subjects. *Physiol Meas.* 2017 Nov 30; 38(12):2186-2202.
4. Urbina EM, Dolan LM, McCoy CE, Khoury PR, Daniels SR, Kimball TR. Relationship between elevated arterial stiffness and increased left ventricular mass in adolescents and young adults. *J Pediatr.* 2011 May;158(5):715-21.
5. Pierce GL, Zhu H, Darracott K, Edet I, Bhagatwala J, Huang Y, Dong Y. Arterial stiffness and pulse-pressure amplification in overweight/obese African-American adolescents: relation with higher systolic and pulse pressure. *Am J Hypertens.* 2013 Jan; 26(1):20-6.