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Miyik-Miyikan Aromatherapy on Postpartum Back Massage Increases Baby Weight Gain

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Abstract

Back Massage technique combined with holistic aromatherapy treatment can be an effective therapy for postnatal mothers to increasing breast milk production. This study aims to analyze the effect of Miyik-miyikan aromatherapy on back massage. The increase of breast milk production in postpartum mothers can be seen from the baby's weight gain. This study was conducted at an inpatient Primary Health Center in Denpasar, in June-October to 30 mothers. This study was designed in a quasi-experimental pre-posttest control group with a time series approach. The observation of the baby's weight gain and breastfeeding satisfaction starts from day 1, day 7, and day 14 after delivery. This study was analyzed using the Kruskal Wallis Test and the Mann Whitney test. The result of the study showed that the Kruskal Wallis test is p <0,05, meaning that there was a difference in breast milk production in the two groups of intervention. Additionally, the Mann Whitney test showed the difference of baby weight on the 7th day to those in the Miyik-miyikan and Cananga group, and on the 14th day in the Cananga, Miyik-miyikan, and Champak group. Thus, the use of Miyik-miyikan aromatherapy on a back massage can be done earlier after delivery

Keywords: Back Massage, Miyik-miyikan, Aromatherapy

1. Introduction

The failure of the breastfeeding process is often caused by obstacles from both the mother and the baby. One of the most inhibitors of breastmilk supply is maternal stress. Sleep deprivation and adjustments to the baby's time cause an increase in the cortisol hormone which then can significantly reduce breastmilk supply (Hechler, Weerth, Beijers, & Riksen, 2018). If the baby is given additional milk outside of breastfeeding, it will reduce the baby's need for breastmilk. Breastfeeding syndrome cannot be overcome by early recognition, and providing practical care assistance to the mother is necessary to increase breastfeeding confidence (Azizah, Rosydah, & Mahfudloh, 2018). Back Massage is an effective and holistic approach in the form of massage on the back along the vertebral column. This technique accelerates the function of the parasympathetic nerves in delivering commands to the back of the brain (Cerebellum) after labor to stimulate the oxytocin reflex or let down reflex so that breastmilk is increasing. Massage contributes to improving sleep quality, speeds up healing, and helps postpartum recovery.

Massage can also stimulate breastmilk to come out earlier on the second day (Morhenn, Francisco, Beavin-yates, & Zak, 2012; Mukhodim, Hanum, & Purwanti, 2015; Nurhayati, 2019).

The addition of aromatherapy to massage provides a soothing sensation, which passes into the bloodstream through the skin in small amounts. The evaporated aromatherapy will be inhaled and relax tense muscles. Miyik-miyikan is made of essential oils from Champak, Cananga, and Pandanus Amaryllifolius (Fragrant Pandanus) which are closely related to postpartum aromatics for the Balinese. This aroma is believed to be able to deliver serenity and self-control so that it benefits the people to live all the burdens of life. Fragrant pandanus contains alkaloids, flavonoids, saponins, tannins, and polyphenols that function as natural antioxidants. It helps wound healing, maintains red blood cells, and nerves and increases endurance (Faras, Wadkar, & Ghosh, 2014).

Antioxidants maintain health, increase skin elasticity, and moisture so that it helps mothers to be confident. Alkaloid compounds in Pandan also increase antidepressant activity by reducing levels of adrenocorticotropic hormones (Hritcu et al., 2020; Ghasemzadeh & Jaafar, 2013). Anti-radical properties are also found in Cananga essential oil in the form of hydroxyl, peroxyl, and alkyl compounds that are needed by breastfeeding mothers in the healing process. Moreover, triterpenoid and flavonoid compounds in Champak essential oil function as antioxidant and antifungal. The natural anti-fungal elements of Champak essential oil will help resist the process of microorganism breeding (Teng et al., 2015). The study aimed to analyze the effect of Miyik-miyikan Aromatherapy on Back Massage towards the increase of postpartum mother's breastmilk supply as seen from the Baby Weight at Denpasar Primary Health Center.

2. Materials and Method

This research is a quasi-experimental pre-posttest control group design with a time series approach and 3 times of the baby's body weight measurement; on the first day (baseline), the seventh day. and the fourteenth day which was carried out at inpatient Primary Health Center in Denpasar from June until October 2019. The sample is as many as 30 people, each group consisting of 6 mothers after labor from day one to fourteen. The treatment group got Miyik-miyikan aromatherapy (P1), Cananga (P2), Champak (P3), and Fragrant Pandanus (P4). Besides, the control group received VCO. The sampling technique was done using non-probability sampling and consecutive sampling. The use of Miyik-miyikan aromatherapy on back massage starts on the first day after labor and is carried out every day until day 14. The massage is done for 10-15 minutes by the husband or relatives who have been trained by the researcher. Then, the data were collected on the first, seventh, and fourteenth days. The changes in the baby's weight were measured using the same weighing scale at the Primary Health Centre followed by home visits. The results of the data normality test with Shapiro Wilk on each aromatherapy were found not to be normally distributed. The baby's weight on the seventh day of testing on Fragrant Pandanus aromatherapy is p (0.001), VCO p (0.039). Also, the baby's weight on day 14 using Fragrant Pandanus aromatherapy is p (0.018). The data analysis was carried out by using the Kruskal Wallis test followed by Post Hoc with the Mann Whitney test.

3. Results

The results of observing the characteristics of the research subjects are as follows

Table 1: Respondents' Characteristics

		Frequency (f)	**Percentage (%)**
Age	20-35	28	93.3
	>35	2	6.7
Parity	Primiparous	8	26.6
	Multiparous	22	73.3
Perineal Laceration	None	9	30
	Grade1	10	33.3
	Grade2	11	36.7
Occupation	Housewife	16	53.3
	Employee	13	43.3
	Civil Servant	1	3.4

Education	Primary	2	6.6
	Secondary	8	26.6
	High School	16	53.3
	Diploma	2	6.6
	Bachelor	2	6.6
Colostrum Period	Day 1	18	60
	Day 2	12	40

According to Table 1, the respondents are mostly in the age range of 20-35 years old, mostly multiparous and housewives, as well as the majority is high school graduates, and also the most colostrum period is on the first day.

Table 2: Analysis of the Effect of Aromatherapy; Miyik-Miyikan, Cananga, Champak, Fragrant Pandanus, and VCO towards Breastmilk Production in Postpartum Mothers Based on Baby Weight

Body Weight		n	p
Day 7	Miyik-Miyikan	6	0,012
	Cananga	6	
	Champak	6	
	Fragrant Pandanus	6	
	VCO	6	
Day 14	Miyik-Miyikan	6	0,004
	Cananga	6	
	Champak	6	
	Fragrant Pandanus	6	
	VCO	6	

Table 2, Kruskal Wallis test indicates that there is at least a difference in breastmilk production (day 7 body weight) between the two groups (p=0,012) and at least a difference in breastmilk production (day 14 body weight) between the two groups (p = 0.004).

To find out which groups have the differences, a Post Hoc analysis was performed using the Mann Whitney test. Post Hoc test with the results as follows:

Table 3: Analysis of the Effect of Aromatherapy; Miyik-Miyikan, Cananga, Champak, Fragrant Pandanus, and VCO towards Breastmilk Production in Postpartum Mothers Based on Baby's weight on Day 7

Baby's weight		Median (minimum- maximum)	P Value
Day 7 Body Weight	Miyik-Miyikan	0 (-200-400)	0,004
	VCO	-50 (-200-500)	
	Cananga	-85 (-300-300)	0,019
	VCO	-50 (-200-500)	
	Champak	285 (-250-450)	0,294
	VCO	-50 (-200-500)	
	Fragrant Pandanus	-200 (-225-690)	0,196
	VCO	-50 (-200-500)	

Table 3 shows that there is a significant difference in baby weight in the p value of Cananga group (0.019), and a very significant difference in Miyik-miyikan group with p value (0.004) on the seventh day after delivery.

Table 4: Analysis of the Effect of Aromatherapy; Miyik-Miyikan, Cananga, Champak, Fragrant Pandanus, and VCO towards Breastmilk Production in Postpartum Mothers Based on Baby's weight on Day 14

Baby's Weight		Median (minimum- maximum)	P Value
Day 14 Body Weight	Miyik-Miyikan	375 (60-650)	0.004
	VCO	432,5 (210-1200)	
	Cananga	325 (50-1200)	0,020
	VCO	432,5 (210-1200)	
	Champak	440 (250-610	0.008
	VCO	432,5 (210-1200)	
	Fragrant Pandanus	380 (60-2000)	0,423
	VCO	432,5 (210-1200)	

According to Table 4, there is a significant difference in baby weight in the p value of Cananga group (0.020) and very significant in Miyik-miyikan with p value (0.004) and Champak with p value (0.008) on the 14th day after delivery.

4. Discussion

The results of the study with the Kruskal Wallis test showed that at least there was a difference in breastmilk production as reported on baby weight between the two groups ($p < 0.05$). The results of the Post Hoc analysis using the Mann Whitney test were consecutively found differences in the weight of the seven-day baby between the Miyik-miyikan-VCO and Cananga-VCO groups. Groups that had differences in baby weight on day 14 were Miyik-miyikan-VCO, Cananga-VCO, and Champak-VCO. In line with these results, it is seen that the three aromatherapies had an impact on breastmilk production on day 14, while only two aromatherapies had an impact on day 7. Also, on the 7th and 14th day, Miyik-miyikan aromatherapy was found to have a very significant effect on breastmilk production observed from the changes in baby's weight.

Miyik-miyikan aromatherapy is a combination of essential oils of Champak, Cananga, and Fragrant Pandanus. The aroma of fragrant pandan leaves has a working mechanism similar to that of antidepressant drugs so that it is such good use to reduce postpartum stress. The main content of Cananga oil is monoterpene which provides a relaxing effect. It also exhibits gentle antioxidant activity. Besides, Champak essential oil is known to have the ability to resist fungal growth and great antioxidant activity. Therefore, the presence of natural anti-fungal elements in Champak essential oil will certainly help inhibit the breeding process of microorganisms (Maulida & Wahyuni, 2018). The combination of aromas resulted from these three components is very soft, fragrant, as well as liked by the respondents. The effect of the three scents provides more benefits than using just one aroma. This aromatherapy massage oil is made in the form of oil with the addition of olive oil or virgin coconut oil (VCO), so it is thicker than essential oils. Its use is to apply it to the body (Ali et al., 2015).

The application of Miyik-miyikan aromatherapy which is rubbed when doing back massage contains two physiological working mechanisms of the human body, namely the blood circulation system, and the olfactory system. Aromatherapy influences a person's psychological, memory, and emotional conditions (Dixon, Skinner,

& Foureur, 2013). Smell stimulates natural communication in humans. An odor arises from a molecule that evaporates into the air and enters the nasal cavity through the respiratory process. The vibrating hairs in the nasal cavity function as receptors to deliver electrochemical messages to a person's emotional and memory centers so that they are recorded by the brain as the olfactory process. Then, the smell is transmitted to the olfactory center. Next, the neuron cell system interprets the smell and delivers it to the limbic system which is then sent to the hypothalamus to process and send throughout the body (Bolbol-Haghighi, Masoumi, & Kazemi, 2016; Smith, Collins, & Crowther, 2011).

The message that is delivered throughout the body will be converted into action by releasing neurochemical substances in the form of feelings such as pleasure, relaxation, calm, or arousal. The molecular size of aromatherapy is tiny so that it can easily penetrate the skin and enter the bloodstream. It is estimated that 5-25% essential oil at a concentration of 1-5% can be applied during massage, but only 4-25% will be absorbed. It takes a few seconds up to two hours for the aromatherapy oil to get in the skin and within four hours to leave the body through urine, sweat, and other excretion processes.

The data shows that from all treatment groups, the baby's weight loss which did not exceed 10%, on the seventh day occurred in 16 babies (53.3%), and on the 14th day, the baby's weight was 100% already above average birth weight. Aromatherapy in this study is entirely applied with the same method, namely through Back Massage. Massage can have both local and systemic effects on the circulatory system and even on the lymph. It can also influence autonomic stimulation, stimulate naturally, soothe, and reduce stress. As a result, postpartum mothers can breastfeed comfortably which can have an impact on the baby's weight since their nutritional needs are fulfilled (Dieterich, Felice, O'Sullivan, & Rasmussen, 2014).

Positive social behavior and physical as well as emotional bonding can affect the release of oxytocin. Stimulation in the form of touch, warmth, olfactory sensation, light pressure, and massage can increase oxytocin released in the blood circulation and in the cerebrospinal fluid. This is because oxytocin has an important role in the continuity of the lactation process. The release of oxytocin is influenced by the stimulation of the baby's suction which then causes an erection of the nipple and helps the production of breastmilk through the lactiferous sinuses to the pores of the nipple (Awano & Shimada, 2010; Carter, 2014).

Touch and massage techniques can activate A - β fibers and slow conduction of the C fiber subpopulation in the body so that it is associated with the release of the oxytocin hormone from the posterior pituitary. The activation of the A - β and C fibers induces changes in the insular context which is the part of the brain that deals with emotions and the interpretation of tactile stimuli. Therefore, giving back massage to women can increase levels of oxytocin, decrease levels of beta-endorphin, and reduce levels of adrenocorticotropin (ACTH). The hormone oxytocin plays an important role in the breastfeeding or lactation process. Physiologically, massage along the vertebrae through neurotransmitters will stimulate the medulla oblongata by sending a message to the hypothalamus in the posterior pituitary. This stimulates the oxytocin reflex or let-down reflex to secrete the oxytocin into the blood. By giving massage, oxytocin will further accelerate breastmilk production and provide comfort to mothers. However, the impact of a massage on the sensations a person feels is not always consistent (Delima, Arni, & Rosya, 2016; Uvna̋s-Moberg et al., 2020).

The touch received during massage treatments can improve the patient's self-image. Massage that is done by the family or relatives is able to foster relationships and communication, especially between husband and wife in terms of taking care of their baby. But on the other hand, every patient does not necessarily have the same preference for massage techniques. The results of massage are highly dependent on the patient group, the massage technique used, and the length of follow-up performed. This is in line with the results of this study, which are not the same although all aromatherapy is applied through massage (Dewi, Dasuki, & Kartini, 2017; Adams, White, & Beckett, 2010; Munevver, Füsun, & Lu, 2020).

5. Conclusion

According to the results and discussions of the research, there is a significant difference in baby weight on the seventh day after delivery in the Cananga group with p-value (0.019), and a significant difference in Miyik-

miyikan group with p-value (0.004). Also, on day 14, there is a significant difference in baby weight in the Cananga group with p-value (0.020) and a very significant difference between the Champak group showing p-value (0.008) and Miyik-miyikan group with p-value (0.004). Miyik-miyikan aromatherapy shows the most significant influence among other aromatherapies for increasing baby weight on day seven and day fourteen.

Acknowledgments

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Customers' Perspectives of Service Quality in Community Pharmacies in Nigeria: A Cross-Sectional Survey

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Abstract

Background: There is a growing need to understand the determinants of service quality in community pharmacy from the viewpoint of customers. Objectives: The study explored customer perspectives of pharmacy services using quality indicators and proposed a path for quality improvement. Methods: A questionnaire-based cross-sectional survey was conducted on 704 conveniently selected customers of community pharmacies between August and October, 2019. The exit survey examined customer expectations compared to actual services received. Questionnaire items were drawn from service quality domains of reliability, assurance, tangibles, equity, and responsiveness. Descriptive statistics was used to summarize demographic characteristics of respondents. To explore gaps between expected and perceived service quality, each domain was subjected to a pairwise t-test. Results: Customers' response rate was 91.2% (n = 642) while their mean age was 52.1±3.55 years. Majority 60% (n = 259) were females, 62.5% (n = 401) had spent five years or less as customers of individual pharmacies. There was significant gap between expected and perceived service quality (t =13.55, p = 0.047). Domains of responsiveness (t = 162.67, p = 0.004) and reliability (t = 27.96, p = 0.023) contributed significantly to this gap with responsiveness being disproportionately impactful. Conclusion: There was significant gap between customer expectations of responsiveness and reliability of pharmacy teams and service fulfilment. This demands improved willingness to prioritize customer needs, serving them promptly, accurately, and as promised.

Keywords: Customer Loyalty, Pharmacy Services, Quality Improvement, Service Quality, Nigeria

1. Introduction

The customer configuration of community pharmacies is evolving rapidly. Recent advances in information communication technologies continue to erode the asymmetry of medicines-related information between the pharmacist and the average patient. Increasingly enlightened patients driven by rising consumerism expect more and more from every caregiver in the healthcare value chain. Competitive forces in the practice environment now demand community pharmacists to embrace customer perspectives of service quality as an important organisational strategy (Ihekoronye, Osemene, Erhun & Afolabi, 2020). This approach becomes critical considering that all pharmacies offer homogeneous products and only differ in the variety and quality of professional services. However in most developing countries, including Nigeria, information on the determinants of service quality in community pharmacy is currently inadequate.

 In many healthcare systems, quality of pharmaceutical services may be assessed based on structure, process and outcomes (Alhusein & Watson, 2019). Service quality in pharmacy practice has been conceptualized to comprise technical and functional dimensions (Holdford & Schulz, 1999; Moulin et al, 2013). The pharmacist draws on his expertise in the core pharmaceutical sciences to offer the technical components of professional services such as prescription handling, patient counseling, and medicines use review, among others. Even with shrinking knowledge gap between the professional and laity, most pharmacy customers are ill-equipped to assess these technical aspects of services. However, there are functional dimensions of pharmacy services comprising the process and setting of the service encounter. Most customers easily make their judgments of the service quality based on these functional attributes (Moulin et al, 2013).

Available evidence suggests a strong correlation between service quality, customer satisfaction and organizational performance in service markets (Ascarza, Fader & Hardie, 2017). Extant literature offers no consensus on the best approach to measure service quality in every context (Ghotbabadi, Feiz & Baharun, 2015). However, several models have been developed including the Gronroos model (Gronroos, 1984), the service quality (or *ServQual*) model sometimes referred to as Gap theory of service quality (Parasuraman, Zeithaml & Berry, 1985), the Extended Gap model (Luk & Layton, 2002), Changing focus of Marketing (Harwood & Garry, 2008), among others. The *ServQual* model however, seems most popular among scholars and appropriate to capture the quality of services in community pharmacies (Xu, 2002; White & Klinner, 2012; Gurl, Blankart & Stargardt, 2019). Many scholars consider the model as robust, hence its growing influence. It measures the perceived gap between expected and actual quality of service delivered to customers. Smaller gaps indicate higher service quality and vice versa. The *ServQual* model measures five dimensions of gaps in service quality, namely

Knowledge gap

When a community pharmacy has inadequate knowledge of customer expectations, it becomes impossible to craft professional services to satisfy them.

Standards gap

Service quality is usually measured against set standards, policies and accompanying rules that guide service delivery. Standards gap arises when the pharmacy draws up quality policies and rules based on false assumptions and ideas about customer expectations. Any service strategy based on such assumptions will be defective and incapable of delivering customer satisfaction.

Delivery gap

Even with appropriate service strategies based on accurate knowledge of customer expectations, a gap may still exist if, in the opinion of the customers, the delivery of professional pharmacy services falls short of their expectations. This may be the result of poor execution of the service strategy as may occur when a pharmacy staff carries out professional service tasks without following established guidelines and protocols.

Communications gap

A community pharmacy may wrongly contrive the marketing communication for its services in such a way as to be easily misunderstood by customers, creating wrong expectations of service quality. A communication gap may also arise when the pharmacy organisation promises things beyond its capacity to deliver.

Satisfaction gap

A satisfaction gap arises whenever, in the opinion of customers, there is a significant difference between the quality of service received and the quality they expected irrespective of the drivers of the pre-purchase expectations. The *ServQual* model measures service quality based on five dimensions including *reliability* (extent to which the service is delivered accurately, dependably, and as promised); *assurance* (extent to which the service inspires trust and confidence); *tangibles* (physical elements of the service); *empathy* (extent to which customers are treated as valued individuals); and *responsiveness* (extent of readiness/willingness to provide prompt service and help customers).

Studies have shown that customers with positive perception of service quality are more likely to be satisfied and this affects the quality of relationship with their service providers (Ascarza, Fader & Hardie, 2017). Relationship marketing efforts such as communication, competence, trust, commitment, conflict handling and accessibility by providers equally influence customer perceptions of service quality (Harwood & Garry, 2008). Evidence suggests that the interplay of these variables influence customer repurchase intentions. Customers that exhibit positive behavioral intentions to repurchase the services often advance to become loyal customers (Hohenberg & Taylor, 2020).
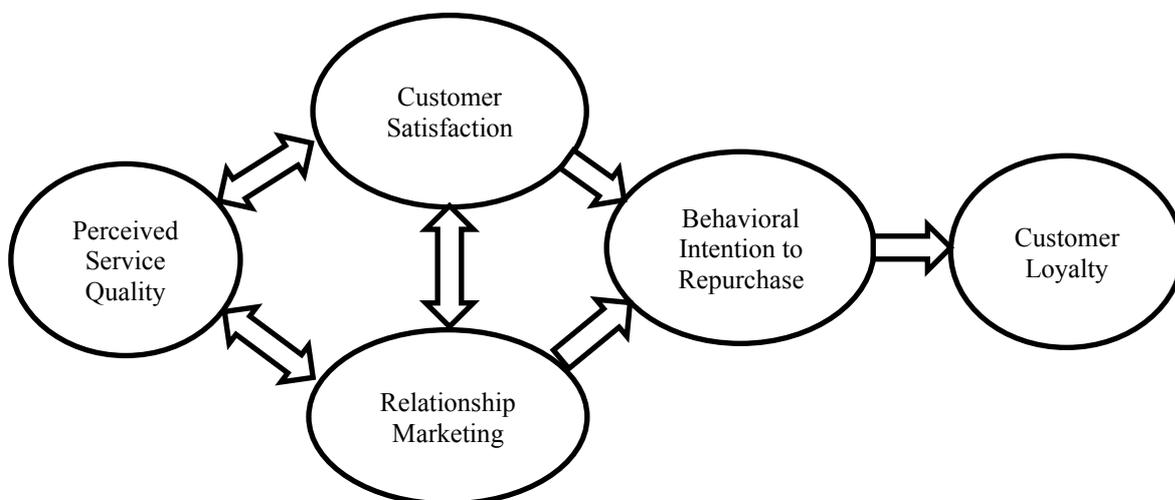
Figure 1: Service Quality and Customer Loyalty (Adapted with permission from Hohenberg & Taylor, 2020)

2. Methods

2.1 *Study Design*

A cross-sectional survey of community pharmacy customers was carried out between August and October, 2019. Study instrument was a structured questionnaire on a five-point Likert scale.

2.2 *Study Participants*

Sample size for the study was calculated to be 587 at 5% margin of error, 95% confidence level and 80% power using an automated online Raosoft calculator (Raosoft Inc. 2004). As was done in a related study (Ong et al, 2020), 20% overage was added to make up for possible attritions, bringing the sample size to 704. Consenting customers who were 18 years old and above were conveniently selected and surveyed in the premises of the pharmacies located across six States in Southwestern Nigeria. The States were chosen for feasibility of data collection and

because they collectively account for about one half of all community pharmacies in Nigeria (Pharmacists Council of Nigeria, 2019). The customers were selected from both urban and rural areas. The number of questionnaires administered in each State reflected the proportion of pharmacies in that State relative to the entire Southwestern population of pharmacies (1941) as follows: Lagos – 432 (61.4%), Ogun – 120 (17.1%), Oyo – 75 (10.6%), Osun – 40 (5.7%), Ondo – 25 (3.5%), and Ekiti – 12 (1.6%), making a total of 704 questionnaires.

2.3 *Study Instrument*

The questionnaire was adapted from the standard *ServQual* instrument (Butt and Cyril de Run, 2010; Ghotbabadi, Feiz and Baharun, 2015). It initially had 23 items which were reduced to 17 following thorough scrutiny by two senior faculty members (experts in pharmacy practice and service management research) who ensured face and construct validity. A local language (Yoruba) translation was provided for customers who could not communicate effectively in English. Back-translation was used to ensure conceptual equivalence. Test-retest validation technique was employed using 20 customers outside the study area to ensure clarity and feasibility of data collection. A Cronbach's alpha value of 0.74 showed strong internal consistency of the instrument.

2.4 *Ethical Approval*

The Health Research Ethics Committee of the Institute of Public Health, Obafemi Awolowo University, Ile-Ife Nigeria, gave ethical approval (HREC:IPHOAU/12/1437) for the study and all respondents gave their written informed consents before taking the survey.

2.5 *Data Collection*

Six research assistants who were proficient in both written and oral English and Yoruba languages were recruited and trained for five days on relevant aspects of the study and their roles as data collectors. Goals of the study and methods of data collection were first explained to pharmacy managers to obtain their permission. Then customers who had already carried out their transactions with the pharmacy were invited to participate in the survey. Those who consented were given questionnaires to fill and return before leaving the premises. Customers spent an average of 12.55 minutes to complete the surveys.

2.6 *Data Analysis*

Data collected were analyzed at $p<0.05$ using IBM SPSS version 22 (IBM Corp, Armonk, NY, USA). Demographic characteristics of respondents and reported performance for attributes of service quality (expected and perceived) were summarized using frequency and percentages. Means ± SD (standard deviation) were used to present expected and actual service qualities while pairwise t-test was employed to test if there were significant differences. Association of demographic variables with perceived service quality was examined using chi square test.

3. Results

3.1 *Customer Characteristics*

Response rate of the customers was 80.1% (n = 642) while their mean age was 52.1±3.55 years (Table 1). Majority (60%) were females. As many as 9 out of 10 respondents were educated to the secondary school level and beyond. Only 13 (2%) of the responses were in the Yoruba translation of the instrument. While 18 (3%) of customers reported that they have remained loyal to particular community pharmacies for up to 20 years, about 63% (n = 401) were in the first 5 years of consistent patronage to individual pharmacies. Chi square test showed no significant variations of perceived service quality along demographic lines.

Table 1: Demographic Characteristics of Community Pharmacy Customers (N-642)

Variable	Freq.	%
Gender		
Male	259	40.3
Female	383	59.7
Age (Years)		
30 and below	27	4.2
31-40	58	9.0
41-50	103	16.0
51-60	320	49.8
Above 60	134	20.9
Highest Level of Education		
Primary School Level	49	7.6
Secondary School Level	388	60.4
Tertiary School Level	205	31.9
How long have you been a Customer of this Pharmacy (Years)		
0-5	401	62.5
6-10	117	18.2
11-15	74	11.5
16-20	32	5.0
Above 20	18	2.8

3.2 *Expected Service Quality*

Almost every customer (99%) had high or very high expectations that the physical outlook of the pharmacy should be appealing (Table 2). Over 90% expected the pharmacy to be well-stocked with the staff well-dressed. Every single customer expected the pharmacy to perform the services right the first time and as promised. Hence none reported a low expectation on these service items. The transition of pharmacy clients from "patients" to "consumers" is seen in the evidence that 98.5% (n – 632) had high or very high expectations to be given prompt attention while 97.6% (n – 628) had high or very high expectations that pharmacy staff could never be too busy to attend to their needs. Only 4 respondents reported not expecting special attention. None of the respondents had a low expectation of the level of knowledge (competence) of the pharmacy staff.

3.3 *Perceived Service Quality*

In terms of service performance, respondents did not score the pharmacies very low on most items. Only 4 (0.6%) individuals reported very low rating of the stocking, 4 (0.6%) gave very low rating of equipment in the pharmacies while 2 (0.3%) scored the pharmacies very low on giving them special attention (Table 3). About 87% (n = 556) scored the pharmacies high or very high in physical layout. However, the fact that as high as 20% (n = 126) rated pharmacy staff dressing low or couldn't say seems significant. A similar percentage perceived that the pharmacies were not well-stocked. It is significant to note that 132 (21%) of respondents reported "can't say" when asked if the pharmacy staff had their best interest at heart, 120 (19%) reported same about their feeling of safety following the service encounter, while 116 (18%) reported same about the consistency of service received. While 578 (90%) scored the pharmacies high or very high on prompt attention, 604 (94%) reported high or very high on being given special attention by the pharmacy staff.

Table 2: Reported Performance for Expected and Perceived Service Quality by Community Pharmacy Customers (N-642)

		Expected Service Quality				Perceived Service Quality			
		Low	Can't Say	High	Very High	Low	Can't Say	High	Very High
S/N	Service Attributes	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
TN1	Its physical environment is appealing	0(0.0)	6(0.9)	278(43.3)	358(55.8)	46(7.2)	40(6.2)	280(43.6)	276(43.0)
TN2	Have modern-looking equipment	4(0.6)	12(1.9)	286(44.5)	340(53.0)	56(8.7)	76(11.8)	254(39.6)	256(39.9)
TN3	The pharmacy is well-stocked	6(0.9)	2(0.3)	306(47.7)	328(51.1)	74(11.5)	58(9.0)	260(40.5)	250(38.9)
TN4	Staff are well-dressed	2(0.3)	24(3.7)	288(44.9)	328(51.1)	58(9.0)	68(10.6)	314(48.9)	202(31.5)
RL1	Provides medicines and services as promised	0(0.0)	10(1.6)	340(53.0)	292(45.5)	6(0.9)	82(12.8)	340(53.0)	214(33.3)
RL2	Performs the service right the first time	0(0.0)	12(1.9)	352(54.8)	278(43.3)	30(4.7)	58(9.0)	308(48.0)	246(38.3)
RL3	Consistent in performance of services	2(0.3)	12(1.9)	358(55.8)	270(42.1)	4(0.6)	116(18.1)	344(53.6)	178(27.7)
RS1	The personnel give me prompt attention	0(0.0)	10(1.6)	340(53.0)	292(45.5)	26(4.0)	38(5.9)	320(49.8)	258(40.2)
RS2	The personnel are never too busy to respond to me	0(0.0)	14(2.2)	316(49.2)	312(48.6)	30(4.7)	54(8.4)	336(52.3)	222(34.6)
RS3	The personnel are always willing to provide service	0(0.0)	4(0.6)	336(52.3)	302(47.0)	24(3.7)	50(7.8)	362(56.4)	206(32.1)
RS4	The personnel are always ready to provide service	2(0.3)	10(1.6)	314(48.9)	316(49.2)	20(3.1)	58(9.0)	346(53.9)	218(34.0)
AS1	I feel safe in my visit to this pharmacy	2(0.3)	12(1.9)	322(50.2)	306(47.7)	36(5.6)	120(18.7)	302(47.0)	184(28.7)
AS2	Employees are knowledgeable to answer my questions	0(0.0)	8(1.2)	356(55.5)	278(43.3)	8(1.2)	94(14.6)	370(57.6)	170(26.5)
AS3	The actions of the personnel instill confidence in me	0(0).0	22(3.4)	340(53.0)	280(43.6)	10(1.6)	112(17.4)	362(56.4)	158(24.6)
EM1	The personnel have my best interest at heart	0(0.0)	20(3.1)	290(45.2)	332(51.7)	6(0.9)	132(20.6)	302(47.0)	202(31.5)
EM2	The personnel understand my specific needs	0(0.0)	12(1.9)	342(53.3)	288(44.9)	2(0.3)	36(5.6)	440(68.5)	164(25.5)
EM3	The personnel give me special attention	4(0.6)	6(0.9)	318(49.5)	314(48.9)	16(2.5)	22(3.4)	462(72.0)	142(22.1)

Abbreviations: TN-Tangibles; RL-Reliability; RS-Responsiveness; AS-Assurance; EM-Empathy

3.4 *Contribution of Service Domains to Overall Service Quality in Community Pharmacy*

Pairwise t-test of the performance of service quality domains (Table 4) showed significant overall difference between expected and actual service quality (t = 19.89, p = 0.001). All domains of service quality had significant contributions to this difference (p = 0.001) but the greatest contribution came from the tangibles (t = 24.91, p = 0.001) followed by assurance (t = 14.70, p = 0.001) while the least was the reliability domain (t = 10.29, p = 0.001). There were no significant difference in scores along gender and educational qualification lines.

Table 3: Differences in Domains of Service Quality in Community Pharmacy

Service quality	Mean	SD	t	p-value
Overall				
Expected	31.82	6.36	13.55	0.047*
Actual	26.25	4.29		
Tangible				
Expected	7.59	2.92	4.95	0.127

Actual	4.46	1.36		
Reliability				
Expected	5.56	1.65	27.96	0.023*
Actual	4.75	1.11		
Responsiveness				
Expected	7.21	2.30	162.67	0.004*
Actual	6.16	1.31		
Assurance				
Expected	5.88	1.68	12.55	0.051
Actual	4.73	1.15		
Empathy				
Expected	5.58	1.54	8.85	0.072
Actual	4.62	1.40		

*Significant at p < 0.05

4. Discussions

The finding that 60% of respondents were females may be due to some random sampling bias and not a superior health-seeking behavior among females as no previous evidence suggests this. The mean age of respondents (52.1±3.55 years) may be explained that most young people are relatively healthy and utilize less of community pharmacy services compared to the elderly. Yet, Nigeria community pharmacists must evolve services that target the bulging young populations. Only 13 (2%) responses being in the local language translation reflects the level of literacy whereby about 90% of the respondents had at least the secondary school level of formal education. The fast growing population of Nigeria with attendant rapid urbanization means most community pharmacies are relatively young. Hence majority 401(63%) of respondents reported being customers to selected pharmacies for only five years or less with only 18 (3%) being up to 20 years as customers of their pharmacies.

The study found significant gap between customer expectations and service fulfilment in agreement with previously established local evidence (Oparah and Kikanme, 2006). The drivers of this gap are complex as many customers do not know what to expect from their service encounters in community pharmacy (Jayaprakash, Rajan and Shivam, 2009). This confusion reflects ambiguities about the role of pharmacists in health systems. Notwithstanding, community pharmacists must aim at customer satisfaction and loyalty via service fulfilment. Customer satisfaction here entails a favorable post-consumption evaluation of perceived service quality relative to pre-purchase expectations (Jayaprakash, Rajan and Shivam, 2009; Al-Mhasnah et al, 2018). Satisfied customers tend to uphold good relations with the pharmacy, adhere to treatment, and achieve better health outcomes (Al-Ali, Bazin and Shamsuddin, 2015). While customer satisfaction has been found to depend on store quality image; service and convenience; and monetary value (Abu-Alhaija et al, 2018; Aziz et al, 2018), it remains a poor predictor of customer loyalty. In fact, customer loyalty has broader antecedents including perceived service quality, customer satisfaction, trust, perceived value, contextual variables, cultural norms and even religious factors in the target market (Nikolova, Dyankova and Petkova, 2017;). Customer loyalty is a commitment to continue using the pharmacy services, and from the same community pharmacy even in the presence of situational factors or marketing efforts intended to cause a switching behaviour (Nikolova, Dyankova and Petkova, 2017; Hohenberg and Taylor, 2020). The significant gap in perceived service quality found in this study calls attention of pharmacy managers to critically evaluate and improve on relevant service quality domains (Osemene and Ihekoronye, 2019).

Responsiveness contributed disproportionately to perceived gaps in service quality (t = 162.67, p = 0.004). This affirms the increasing sophistication of community pharmacy customers who demand greater readiness of pharmacy teams to serve them promptly and deliver value for their time. This finding agrees with evidence from Australian (White and Klinner, 2012) and German studies (Gurl, Blankart and Stargardt, 2019). However, the finding that the domain of reliability was the second highest contributor to perceived gaps in service quality (t = 27.96, p = 0.023) runs contrary to the cited German study in which reliability had insignificant influence on perceived customer value. Tipton (2009) had earlier argued that of all the dimensions of service quality in

community pharmacy, reliability which connotes "just do what you say you will do" was the most highly valued and rated construct by customers. Obviously this is at variance with the outcome of our study where responsiveness which represents "willingness to help customers and provide prompt service" was revealed as the most highly valued dimension. Reasons for such disparity in study outcomes could be the nature and peculiarities of the study settings and populations; the ever-changing customer expectations; and varied experiences of customers arising from previous exposure to many services. All these reinforce the widely-held view that the standard of measuring quality of services by customers is largely based on a psychological premise (Parasuraman, Zeithml and Berry, 1994). Consumer expectations of services are based on desirability and adequacy of such services. This is clearly expressed in the quality-of-service equation where customers constantly carry out their assessment of their expectations for a service against their perceptions of that service.

The trust and confidence inspired by the community pharmacists was high (assurance: $t = 12.55$; $p = 0.052$). In line with the vision of International Pharmaceutical Federation (FIP, 2015), this finding underscores the opportunity and responsibility of community pharmacists to improve public confidence in their competences as healthcare professionals, making clients feel safe to share their health concerns and adhere to medication plans under the guidance of their pharmacists. Respondents felt treated like valued individuals (empathy: $t = 8.83$; $p = 0.072$), and were significantly impressed with the physical evidence of the pharmacies (tangibles: $t = 4.95$; $p = 0.127$). These three domains did not contribute significantly to perceived gaps in service quality, affirming previous ratings (Holdford and Schulz, 1999; Moulin et al, 2013; Gurl, Blankart and Stargardt, 2019). Tangibles were closest to customer expectations, affirming Good Pharmacy Practice (GPP) guidelines which emphasize pharmacy location, ambience, provisions for private consulting areas, packing lots, inventory merchandizing practices, among others (GPP, 2012).

Evidence from Australia and Southern Africa suggest a pattern of strong connection between service quality and customer loyalty in community pharmacy (White and Klinner, 2012; Chiguvi, 2016). In the competitive business environment, achieving and sustaining customer loyalty requires accurate calibration and satisfaction of the ever-changing needs of clients. This entails constant improvements in service quality in such a manner that delivers superior customer value (Gurl, Blankart and Stargardt, 2019). Quality improvements here may be understood in terms of constant efforts by community pharmacy teams to make the changes necessary for better patient outcomes (health), better system performance (care) and better professional development (learning) (Batalden and Davidoff, 2007). We posit that quality improvements in community pharmacy must go beyond customer satisfaction to calibrating and maximizing customers' behavioral intentions to re-purchase pharmacy services. Hence there is need to pay close attention to indicators such as cross-buying behavior, positive word of mouth behavior, price increase tolerance, and actual repurchase behavior (Mortimer, Grimmer and Fazal-E-Hasan, 2019). These antecedents of customer loyalty are important given that about 70% of sales in community pharmacy are derived from repeat purchases and retaining loyal customers have been shown to cost the pharmacy organization much less than attracting and serving new ones (Lee, Godwin and Kim, 2015). Available evidence shows that such quality improvements enhance health-seeking behavior and adherence by customers, while the pharmacy enjoys better customer satisfaction, customer loyalty and competitive advantage (Ross, 2013). In this era of rising consumerism (Harwood and Garry, 2008) and as previously highlighted by the authors (Osemene and Ihekoronye, 2019), relationship marketing practices must become the new norm in community pharmacy, making each customer feel special, understood and valued by the entire pharmacy team at every service encounter.

5. Conclusions

Responsiveness and reliability contributed significantly to perceived gaps in service quality while empathy, assurance and tangibles did not. The wide disconnect between customer expectations of responsiveness and service fulfilment implies there is urgent need for community pharmacists to demonstrate improved readiness and willingness to prioritize customer needs, serving them promptly, accurately and as promised.

6. Acknowledgement

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Review of Arrhythmias in Children with Congenital Heart Disease in Albaha Area, Saudi Arabia

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Abstract
Background: Arrhythmias are common in children with congenital heart disease (CHD) and contribute to morbidity and mortality. The prevalence, type, and presentation vary depending age and other factors. Objectives: This study aimed to determine the prevalence of arrhythmias and associated factors in children with CHD in King Fahad Hospital, Al Baha, Saudi Arabia. Methods: This was a hospital-based retrospective cross-sectional study conducted from January 2010 to December 2020. In total, 185 patients, aged 1 day to 14 years, were included. Children with arrhythmias and CHD were included, while those without CHD were excluded. Data were analyzed using SPSS version 16.0. Results: Arrhythmias were confirmed in 46 patients (24.86%), while 139 patients (75.14%) had no electrocardiographic abnormalities, 95 % CI (14.12–21.22). Among the arrhythmias, we found that first-degree atrio-ventricular block was the most common and reported in 30 patients (16.21%); atrial tachyarrhythmias in 5 patients (2.7 %); premature ventricular contractions in 4 patients (2.16%); premature atrial contractions in 3 patients (1.62%); sinus bradycardia in 2 patients (1.1%); complete heart block in 1 patient and a prolonged QT interval with severe hypokalemia, ((0.54%) for each. Conclusion: Arrhythmias are common in children with CHD, and early diagnosis and regular follow-up have significant benefits in management. Cardiac surgery, heart failure, digoxin, and electrolyte disturbances were confirmed as risk factors.
Article

Keywords: Children, Congenital Heart Disease, Arrhythmia

Abbreviations
CHD: congenital heart disease; VSD: ventricular septal defect; ASD: atrial septal defect; AV: atrio-ventricular; AVC: atrio-ventricular canal; ECG: electrocardiography; TGA: transposition of great arteries; DORV: double outlet right ventricle; PACs: premature atrial contractions; PVCs: premature ventricular contractions; TOF: Tetralogy of Fallot; CI: confidence interval; KFH: King Fahad Hospital.

Background

Children with congenital heart disease (CHD) develop many complications such as failure to thrive, heart failure, cyanosis, and arrhythmias [Ronald Wells M.D. Paul Khairy MD etal.]. Arrhythmias are associated with severe cardiac dysfunction. Structural abnormalities and conductive tissue dysfunction are important factors that predispose children with CHD to cardiac arrhythmias, which can affect their morbidity and mortality. The clinical presentation of arrhythmias can differ depending on age, metabolism of cardiac tissue, hemodynamic changes, and the type of CHD [Reena M Ghosh, Gregory J Gates etal, Antonio Herna´ndez-Madrid e tal]. The risk of atrial fibrillation can be increased with long PR intervals and other types of atrial dysrhythmias [Arsha Karbassi, Krishnakumar Nair etal, Cheng S, Keyes MJ etal]. Atrial tachyarrhythmia is more commonly associated with adult CHD and is one of the most common complications [Cheng S, Keyes MJ etal]. Many normal healthy children develop supraventricular tachycardia, and physicians should be familiar with its presentation and management [Schlechte EA, Boramanand N etal]. Electrolyte imbalances and poor nutritional status can also increase the risk of arrhythmias [World Health Organization]. In addition, hemodynamic changes increase the risk of atrial and ventricular arrhythmias associated with CHD. A wide range of arrhythmias can be present in CHD, and each one needs to be well managed. Ablation can be performed in unresponsive cases of arrhythmias [Charlotte A Houck, Stephanie F Chandler etal]. Arrhythmias are also frequent in children who have undergone cardiac surgery. Age >5 years, low weight, long bypass time, electrolyte imbalances, use of digoxin, and use of inotropes are considered risk factors for postoperative arrhythmias [Anthony Batte, Peter Lwabi etal, Tabitha G Moe, Victor A Abrich etal]. In addition, the type of surgical procedure, irritation of the conductive tissue by humoral factors during surgery, postoperative scarring, high serum lactate levels, and hypotension during and after surgery increase the incidence of arrhythmias [Tarek Ahmed Abdel Gawad etal, Lars Grosse-Wortmann, Suzanna Kreitz etal, Sahu MK, Das A etal, Grosse-Wortmann L, Kreitz S etal]. Early diagnosis of CHD are important in the management of associated arrhythmias [Mocumbi AO, Lameira E etal].

Objectives and methods

This study aimed to determine the prevalence of and risk factors associated with arrhythmias among children with CHD. The study was approved by the Ethical Research Committee in King Fahad Hospital (KFH), Al Baha, Saudi Arabia. This was a retrospective hospital-based cross-sectional study conducted in the pediatric and neonatology departments of KFH from January 2010 to December 2020. The sample size needed was calculated using the Leslie Kish formula [Jon Wiley and Sons INC]. Total of 185 cases were reviewed for the presence of CHD and arrhythmias. The patients' ages ranged between 1 day and 14 years. Patients with CHD who had arrhythmias were included, and children with normal heart structures were excluded. Clinical examination, electrocardiography (ECG), and echocardiography were performed by a pediatric cardiologist. Holter ECG was performed in some cases to confirm the diagnosis. A complete blood count was performed and serum electrolyte levels were assessed for each child. The type of CHD, the type of arrhythmia, surgical procedures performed, patient age, sex, electrolyte imbalances, and use of certain medications were all evaluated. A thyroid function test performed in cases of tachy and bradyarrhythmias. Statistical analyses were performed using SPSS version 16.0.

Results

As shown in Table1-2, we reviewed 185 medical records of children diagnosed with CHD, aged 1 day to 14 years. The majority of the children, 105 (56.76 %), were female, and 80 (43.24%) were male. Ventricular septal defect (VSD) was the most common type of CHD, seen in 55 of the cases (29.73%), followed atrial septal defect in 37 (20%), patent ductus arteriosus in 35 (18.92%), tetralogy of Fallot (TOF) in 20 (10.81 %), atrio-ventricular canal (AVC) in 11 (5.95%), mitral valve prolapse in 10 (5.41%), pulmonary stenosis in 7 (3.78%), aortic stenosis in 4 (2.16%), d-transposition of great arteries (TGA) in 3 (1.62%), double outlet right ventricle in 2 (1.1%), and Ebstein anomaly in 1 (0.54%). Arrhythmias were found in 46 patients (24.86%), while no arrhythmias were found in 139 patients (75.14%), 95 % confidence interval (CI) (14.12–21.22). First-degree atrio-ventricular heart blocks were diagnosed in 30 patients (16.21%), 95 % CI (12.8–21.6). It was more common in patients older than five years and was increased with the use of medication such as digoxin, and the

presence of hypokalemia (OR 3.75), 95 % CI (11.60–18.86). Atrial tachyarrhythmias in 5 patients (2.7 %), 95 % CI (11.2–16.22), premature ventricular contractions (PVCs) in 4 patients (2.16%), 95 % CI (10.2-17.12), premature atrial contractions (PACs) in 3 patients (1.62%), 95% CI (9.5-17.5), sinus bradycardia in 2 patients (1.1%) 95% CI (8.15-18.5), complete heart block in 1 patient (0.54%), 95 % CI (2.7–6.6), and prolonged QT interval associated with severe hypokalemia in 1 patient (0.54%). Electrolyte abnormalities were confirmed in few cases, and it was associated with in premature extrasystole contraction ($P = 0.008$).

Discussion

Multiple structural heart anomalies were observed in the patients. In this study, arrhythmias were found in 46/185 patients (24.86%) of children with congenital heart disease, while in 139/185 (75.14%) patients, no arrhythmias were documented, as mentioned in many published articles [Tabitha G MoeTarek Ahmed etal, Abdel Gawad etal, Lars Grosse-Wortmann, Suzanna Kreitz etal]. The high prevalence of first-degree heart blocks in this study was compatible with the results of other international studies [Arsha Karbassi, Krishnakumar Nair etal, Cheng S, Keyes MJ etal, Grosse-Wortmann L, Kreitz S etal, Mocumbi AO, Lameira E etal]. The majority of patients underwent palliative corrective heart surgery, and no electrolyte abnormalities were observed. As mentioned in the literature, first-degree AV block was considered a benign condition in children, but it has also been associated with an increased risk of atrial fibrillation [Cheng S, Keyes MJ etal, Tabitha G Moe, Victor A Abrich etal]. Atrial tachyarrhythmia was confirmed in 5 patients (2.7%). In 4 patients (2.16%) who had VSD, PVCs were diagnosed. The prevalence of PVCs was reported to be 1.5% among children with CHD in other published studies [World Health Organization paper]. In 3 patients (1.62%) with PACs reported, 2 had TOF, and the third had a complete AVC. Additionally, in those 3 patients, laboratory results were normal in 2, while the third patient had hypokalemia [Tabitha G Moe, Victor A Abrich etak#l, Anthony Batte, Peter Lwabi etal]. Two patients (1.1%) had sinus bradycardia. There are limited data available on this issue. Complete heart block was confirmed in 1 patient (0.54%) who underwent TOF repair with normal laboratory workup, which was comparable to other international studies. A prolonged QT interval with severe hypokalemia in reported with 1 patient (0.54%). Holter ECG was helpful for diagnosis in two cases [Anthony Batte, Peter Lwabi etal, Sahu MK, Das A, Siddharth B etal]. These results indicate that ECG should be performed regularly in children with CHD. In this study, we found that children aged 6 years and older were more likely to have first-degree heart block associated with digoxin, compared to children younger than this age, who can tolerate more before the manifestations of digoxin toxicity occur.

Study limitations
No genetic investigations were performed to evaluate the genetic contribution of arrhythmias associated with CHD.

Conclusion

Arrhythmias are relatively common among children with CHD in the Al Baha area of Saudi Arabia. This study found that the type of CHD and surgical procedure, age, digoxin use, and electrolyte imbalances were important factors that need to be assessed among children with CHD. Early diagnosis and management are important.

Table 1: distribution of CHD presented in Children included in the study.

Abnormality	Frequency	Percentage	P value
Total patients	185	100%	
Ventricular Septal Defect	55	29.73%	0.07
Atrial septal defect	37	20%	0.08
Patent Ductus Arteriosus	35	18.92%	0.08
Tetralogy of Fallot	20	10.81%	0.09
Complete atrio-ventricular defect	11	5.95%	0.06
Mitral valve prolapse	10	5.41%	0.07
Pulmonary stenosis	7	3.78%	0.05
Aortic stenosis	4	2.16%	0.06
Transposition of Great Arteries	3	1.62%	0.05

Double outlet right ventricle	2	1.1%	0.05
Ebstein anomaly	1	0.54%	0.08

Table 2: distribution of arrhythmias found in this study.

Arrhythmia	Frequency	Percentage	(95 % CI)
First degree A-V block	30	16.21%	(12.8 – 21.6)
Atrial tachyarrhythmias	5	2.7%	(11.2-16.22)
Premature ventricular contractions	4	2.16%	(10.2- 17.12)
Premature atrial contractions	3	1.62%	(9.5 – 17.5)
Sinus bradycardia	2	1.1%	(8.15 – 18.5)
Complete heart block	1	0.54%	(11.5 – 19.5)
Long QT	1	0.54%	(11.5 – 19.5)
No arrhythmias confirmed	139	75.13%	(14.12 – 21.22)

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Factors Underlying Perceptions of Quality of Life Among Acne Patients in R. N. Macedonia

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Abstract
Introduction: Acne vulgaris is a disorder of the pilosebaceous units. It is a chronic inflammatory dermatosis notable for open/closed comedones, papules, pustules, nodules. It is characterized by open comedones, closed comedones and pustular nodules. Aim of study: To examine factors underlying the quality of life of people with acne. Materials and method: A total of 576 respondents were included in the study. Acne specific Quality of Life questionnaire was used for this purpose. A prospective cross-sectional study was conducted, performed in private dermatological clinic as well as on-line. All analyses were conducted by using the SPSS.26 for Windows. Results and Discussion: 5.7 % were males and 94.3 percent were females. About 69.4% were aged between 15-25; 16.7 % between 26 to 30; 8.8% between 31 to 35 years old. Quality of life and emotional perception towards the social environment is demonstrated by the three components (self-perception of discomfort, functionality, and social factor). The reliability levels for the three components were .858 for self-perception of discomfort, .779 for functionality and .745 for the social factor. The factor analysis discovered three underlying factors: self-perception of discomfort, social factor and functionality in daily life. Conclusion: The findings confirm the general notion that people with acne have problems in quality of life and therefore special attention to psychological intervention should be given in the treatment of acne.

Keywords: Acne Patients, Perceptions, Quality of Life, Factors

1. Introduction

Acne vulgaris is the commonest cutaneous condition treated by physicians (Pochi, 1990). It is a chronic, self-limiting inflammatory disorder of the pilosebaceous units (Kaushik et al., 2017). Acne as a chronic inflammatory condition involves four elements: the sebaceous gland, the follicular canal epithelium, a bacterium called Propionibacterium acnes and innate cutaneous immunity (Pawin et al., 2004; Cunliffe et al., 2004). Although acne is a benign condition which causes mainly cosmetic disfigurement, it can greatly affect the quality

of life of the patients. Since its introduction in the medical literature in the 1960s, the term "quality of life" has become increasingly popular in recent decades (Post, 2014). The root of the QOL concept goes back to the 1947 when the World Health Organization (WHO) defined health as a "state of complete physical, mental and social well-being, and not merely the absence of disease and infirmity (World Health Organization, 1947). The term "well-being" although confusing and not thoroughly defined, incorporated issues like psychological and mental factors into the concept of health. The majority of methodologists in the health and the social sciences have followed this definition and adopted a policy of incorporating at least 3 dimensions in any scale to measure QOL, namely physical function, mental status, and ability to engage in normative social interactions (Spitzer, 1987). Many studies have shown the negative impact of acne on the quality of life of acne patients, taking into consideration different perspectives of the problem and measuring different factors (Chernyshov et al., 2018; Vilar et al., 2015; França and Keri, 2017; Durai and Nair, 2015; Eyüboglu and Eyüboglu, 2018). Although acne is a self – limiting condition for the period of time that it lasts, it is perceived as a stressful condition to an individually different extent and affecting many different aspects of the quality of life of the acne patient. This can be understood by the fact that the skin and especially the face are important self-presenting factors towards the outside world and therefore even small number of lesions can impair the quality of life and factors like feeling dissatisfied, embarrassed and experiencing low self-confidence can emerge. Acne patients can feel unattractive to a different extent and that can have psychological impact on the patient, which can result in becoming introvert, refusing to communicate with peers, poor focus on school or work. The social environment can enhance this behaviour with actions such as bullying, avoiding and rejecting the friendship with the acne patient. It has to be taken into consideration that acne mostly affects teenagers and adolescents at a vulnerable phase when self-confidence and social abilities have to be developed, but instead this skin disease can have negative functional and emotional effects on their personality (Ismail and Mohammed-Ali, 2013). Therefore, acne is not a trivial disease in comparison with other chronic conditions (Jones-Caballero et al., 2007) and special attention has to be given to the psychological aspects of this skin disease. The aim of our study is to identify the factors that are perceived by acne patients in R. N. Macedonia and have impact on the quality of their life.

2. Method

The Method section describes in detail how the study was conducted, including conceptual and operational details. A prospective cross-sectional study was conducted. It entailed a combination of interviews in private dermatological clinic as well as on-line. The research was conducted in duration of three months from January until March 2020. A total of 576 were questionnaires were collected (convenient sample of people with acne). Keeping abreast with previously conducted studies in healthcare settings, a sample size of minimum 500 respondents was envisioned.

For the purpose of this research a special questionnaire was designed, which consisted of close-ended questions that incorporated previously designed questionnaires (Gupta et al., 1998; Al-Shidani et al., 2015). Besides using the original sections of the instrument, several additional sections were deployed in order to enable gathering data which will reflect the situation with acne in R. N. Macedonia. These new sections contributed to understanding the in-depth views of the patients on quality of life with acnes. The questionnaire consisted of: a set of demographic questions (gender, age and profession) 6 questions concerning self-evaluation of severity of acne, 7 questions about self-perception of quality of life of acne patients, and 6 questions about self-evaluation of social factors using Likert scale with scores from 1-5. After the completion of field work and check for quality of the completed questionnaires, they were coded and processed.

Descriptive statistics were used to describe the demographic characteristics of the sample. All analyses were conducted by using the SPSS.26 for Windows. The survey was conducted on the basis of confidentiality, anonymity and voluntary participation. Written consent was not required to preserve the anonymity of the participants. Nevertheless, none of the reports prepared on the basis of data obtained from the study contain information to identify any of the participants.

3. Results

Out of all respondents, 5.7 percent were males and 94.3 percent were females. About 69.4 percent were aged between 15-25; 16.7 percent aged between 26 to 30; 8.8 percent aged between 31 to 35. The sample comprised a comprehensive mixture of generational cohorts and can be assumed as a representative sample of the population. The complete demographic profile of the participants is given in Table 1.

Participants responded to overall severity of acne which affects certain parts of their body. They provided self-perception about acne such as extent to which part of the body was affected with acne. The results from the question where they have the biggest number of acne on the body: face, back, chest and shoulder on a scale from 1-5; 5-10; 10-20; 20 and more are given in Table 3. The location of acne is presented in Table 2. In the same context, the participants responded to the question related to severity of acne symptoms affecting their face: redness or inflammation of the face, acne pustules, oily skin from the acne, scars from the acne where the result prevailed on redness or inflammation of the face (Table 4).

Table 1: Demographic profile of participants

Options	N	%
Age	561	
15-25	399	**69.4%**
26-30	96	**16.7%**
31-35	50	**8.7%**
other	5	**0.8%**
Gender	575	
Male	33	**5.7%**
Female	542	**94.3%**
Occupation	571	
Pupil	73	**12.7%**
Student	240	**41.7%**
Employed	202	**35.1%**
Unemployed	56	**9.7%**

Table 2: Location of acne

Location of Acne	Face	Back	Chest	Shoulders
N	**556**	210	93	148

Table 3: Number of acne on the body

No	Frequency	Percent

1-5	92	16.0
5-10	**208**	**36.2**
10-15	89	15.5
10-20	66	11.5
20+	116	20.2
Total	571	99.3

Table 4: Severity of Acne

Measures	Redness or Skin Inflammation	Acne Pustules	Oily Skin	Acne Scars
Mean	2.01	2.09	1.78	1.82
Std. Deviation	.656	.671	.703	.733

Participants responded to one section of the questionnaire rated as a Likert scale on quality of life of patients with acne on a scale from 1 to 4: extremely a lot, very much, little, not at all. The question items were developed based on the literature review. All items are provided in the Factor analysis at Table 5. Principal Component analysis (PCA) was used to analyse the Likert Scale of 2 sections (12 items) of the research tool: quality of life and emotional perception towards the social environment. The Kaiser Meyer Olkin (KMO) sampling adequacy measure was .882 and Bartlett's measure was significant ($p<0.001$). The factor loads showed in the Table 5, explained 63 percent of total variance after using Oblimin rotation and produced three main factors. Assessment loaded items on each component showed a high degree of individual item reliability, as all items have loadings of greater than 0.50 on each component. From the Table 4 is can be seen that the three main components of the PCA including, self-perception of discomfort, functionality and social factor. The reliability measure for each component was tested with Cronbach's Alpha (α). All component measures were greater than .745 as it is indicated in the Table 5, which shows strong internal reliability among components. The reliability levels for the three components were .858 for self-perception of discomfort, .779 for functionality and .745 for the social factor.

Table 5: Factor analysis

Factors	1	2	3
Cronbach's Alpha (α)	**.858**	**.779**	**.745**
Feeling dissatisfied	.826		
Feeling embarrassed	.805		
Self-Confidence/Self-esteem	.791		
Feeling Unattractive	.768		
People Pick On Me		.858	
People bullying on me		.855	
People stare at me	-	.704	
People avoid me		.530	
Feeling rejected			.815
Low Performance at school	.		.779
Difficulties with the social environment			.712
People are friendly	-		.533

Extraction Method: Principal Component Analysis.

Rotation Method: Oblimin with Kaiser Normalization.

a. Rotation converged in 8 iterations.

4. Discussion

There are various discomfort outcomes when it comes to quality of life related to acne. The aim of the study was to discover which difficulties patients with acne face in their daily life. The study examined factors that are perceived by acne patients in R. N. Macedonia and have certain impact on the quality of their life on 12 items (Table 5). This was conducted with a principal component analysis that was used to determine the main factors which influence the quality of life among patients with acne. Those loaded factors suggested presence of three main dimensions in regard to the effects of acne on the quality of life – personal appearance or self-perception and the social environment towards the person with acne. The dimensions consisted of 4 items each with total accounting of loaded factors of 63 percent of total variance. This path estimate of the suggested model provides insights into relationships among various constructs. Also, the reliability and validity of the factor scale were assessed in various ways, and the scale was found to have good reliability and validity across different patients with acne and quality of life.

Therefore, different items were empirically tested among people with acne in order to get the underlying factors. The analysis revealed three factors related to discomfort in everyday life of patients with acne. The factor analysis discovered three underlying factors: Self-perception of discomfort, social factor and functionality in daily life. High loading on the three subscales provides proofs about existence of different difficulties that persons with acne face in their life.

The first factor included dissatisfaction with personal appearance as the highest, embarrassment, feeling of unattractiveness to others. This factor clearly shows the psychological issues that persons with acne face. This is related to self-image and presentation to others and therefore it could be harmful in the long term as stated in the literature (Kotekoglu et al., 2020).

The second factor is about the impact of the environmental or social factors and their perceived influence on acne patients. The items that belong to this factor are: picking on people with acne, bullying, staring and perception of avoidance. (Magin et al., 2008). This is clearly an indicator that personal appearance could lead to experiencing negative consequences from the environment.

The third factor includes feeling of abandonment, low performance at work, difficulties with adapting to the environment and possible friendly approach by others. (Hazarika and Archana, 2018). This is the most dangerous factor because it affects the mental health and therefore it deserves special attention in the treatment of acne.

Due to the fact that the appearance is of personal importance and reinforces different behaviours in social settings, and due to the fact that medical treatment of acne is a long-term process, the focus should be on therapy which would enable the patient to overcome this difficulty. The finding clearly shows a path for working with people with acne and the focus should be on enabling these people to function in the environment.

This study determines the factors underlying the perception of quality of life among acne patients in R. N. Macedonia. The main conclusions found are: dissatisfaction with personal look, embarrassment, feeling of unattractiveness and all these show the psychological issues that people with acne face. That relates to self-perception which is harmful in a way that obstructs everyday life of the patients with acne and are connected to low self-esteem which leads to isolation, promotes sadness, potentiates introvert character and various forms of depression too.

The environment also reacts to acne patients with bullying, staring and avoidance which potentiate the insecure and fragile character of an acne patient. The third factor connects with social interactions including sense of abandonment, poor performance at school, at work and difficulties in interaction with friends and partners.
The findings confirm the general notion that people with acne have problems in quality of life and therefore special attention to psychological intervention should be devoted to the treatment of acne, apart from medical treatment.

Further testing of the three subscales needs to be conducted in order to check for prediction of other psychopathological measures. Also, there is a need for testing among different age groups and occupations to determine different outcomes related to presence of acne.

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Catastrophic Health Expenditure, Distress Financing and Impoverishment due to Out-of-Pocket Expenses for Healthcare among Patients with Chronic Liver Disease: A Cross-sectional Study among Hospitalized Patients in Bangladesh

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Abstract
Out-of-pocket (OOP) expenses for hospitalized patients with chronic liver disease (CLD) poses an economic challenge on affected household in the form of catastrophic health expenditure (CHE), distress financing and impoverishment. OOP Expenses data for hospitalized CLD patients from Bangladesh is scarce. This study aimed to estimate the OOP expenses and resulting CHE, distress financing and impoverishment among hospitalized patients with CLD. This cross-sectional study was conducted among conveniently selected 107 diagnosed CLD patients admitted at Bangabandhu Sheikh Mujib Medical University (BSMMU) and Dhaka Medical College Hospital (DMCH) aged 18 years and above. Data were collected from the respondents using a semi-structured questionnaire through face to face interview during discharge from hospital. Out of pocket expenditure for chronic liver disease in selected hospitals was Bangladeshi Taka (BDT) 19,262. Direct medical, direct non-medical and indirect cost was BDT 16,240; 2,165 and 1,510, respectively. Investigation cost and medicine cost contributed to 48.48% and 31.81% of the total OOP expenses, respectively. At 10% threshold level, 29% of the respondents were affected by CHE. 64.5% of the respondents were facing distress financing due to OOP expenses. Among the respondents, 1.9% slipped below the international poverty line of $1.90 (BDT 161.10, in 2019).There was statistically significant (p < 0.05) difference among the mean OOP expenses for different etiological types of chronic liver disease. The study concluded that it requires establishing a more accessible and affordable decentralized health care system for CLD treatment along with the implementation of financial risk protection.

1. Introduction

Chronic liver diseases (CLD) have become a global public health issue and one of the leading causes of morbidity and mortality irrespective of age, gender, region or race, chronic hepatitis-B, chronic hepatitis-C and liver cirrhosis affects nearly a billion people, and cause about 2 million deaths each year, accounting for 3.5% of all deaths worldwide (Byass, 2014; Xiao et al., 2019; Marcellin & Kutala, 2018). Deaths due to complication of liver cirrhosis are the 11th most common reason of death worldwide (Asrani, Devarbhavi, Eaton & Kamath, 2019). The estimated worldwide prevalence of hepatitis-B is 3.6%, hepatitis-C is 2.5% and liver cirrhosis is 8.5% (EASL, 2012; Hope, Eramova, Capurro & Donoghoe, 2014). In Bangladesh, more than 8 million people suffer from hepatitis-B (Mahtab et al., 2008). Prevalence of hepatitis-B shows substantial heterogeneity among studies, but from recent studies among Bangladeshi population, hepatitis-B shows a prevalence of 4-5.6% (Uz-Zaman, Rahman & Yasmin, 2018; Noor-E-Alam, 2018). On the other hand, hepatitis C is prevalent in 0.2-1% of the citizens of Bangladesh (Mamun-Al-Mahtab, 2016).

Due to the demographic and epidemiological transition, non-communicable disease like CLD is becoming a major economic burden (Stepanova et al.,2017), as it imposes heavy costs on both the healthcare system and the affected households. In a low middle-income country like Bangladesh, health expenses are mostly paid by affected households in the form of out-of-pocket (OOP) expenses (van Doorslaer et al., 2006; van Doorslaer et al., 2007; Huq, Al-Amin Howlader & Kabir, 2015). OOP expenses are primary means of financing healthcare in much of Asia, where the ratio of OOP expenses to total health expenditure ranges from 30 to 82%. In Bangladesh OOP cost, as a share of total health expenditure was 62.4 % in 2003, which became 67% in 2015 (BNHA-V, 2018). In 2017, OOP expenses raised to 73.9% of the total health expenses (World Data Atlas, 2020), showing an average growth rate of 1.22%. On 2015, Bangladesh spent 3.4 % of GDP on health and on 2017, 2.3% (BNHA-V, 2018; World Data Atlas, 2020). Annual per capita health expenses were $27 in 2015 and $36 in 2017 (BNHA-V, 2018; World Data Atlas, 2020), of which, more than two third was paid by the households, exerting one of the highest OOP healthcare expenses on affected households economy, exposing them to significant financial risk with potential catastrophic health expenditure where households spends more than 10% of their yearly income (Azzani, Roslani & Su, 2019). When OOP healthcare expense become high enough, households, especially those below or near poverty line spends a substantial share of their income, which they are unable to recuperate from existing resources, disrupting their living standards and ultimately slip below the poverty line (Huq, Al-Amin, Howlader & Kabir, 2015) In more extreme cases, to meet the expenses, it can cause households to resort to borrowing or some other means of collecting cash, exposing them to debt, which ultimately push them further down the poverty line (Khan, Ahmed & Evans, 2017). The OOP expenses for health care services have always been quite expensive for general population of Bangladesh (Huq, Al-Amin Howlader & Kabir, 2015) causing considerable financial risk as 25.5% of the population in Bangladesh lives below poverty line and 12.3% lives in extreme poverty (Kabir, Begum& Hossain, 2006; Chowdhury & Hossain, 2019). Each year OOP expenses for health care services push another 4.2% to extreme poverty (Huq, Al-Amin Howlader & Kabir, 2015) .Globally, each year, 25 million household is being affected by impoverishment due to OOP expenses for healthcare needs (Xu et al., 2006). The impoverishment effect of OOP expenses for health care services is most severe in low- and middle-income countries, matching Bangladesh, where poverty rate is much higher (Huq, Al-Amin, Howlader & Kabir, 2015) .

While there are researches being conducted on the prevalence and distribution of CLD among Bangladeshi population, any research that addresses the issues of financial burden of CLD treatment among hospitalized patients in Bangladesh couldn't be found. An evaluation of out-of-pocket expenses of hospitalized patients with CLD will give us a better understanding of the financial impact of chronic liver disease on patients and their families. This study also assessed the prevalence of catastrophic health expenditure and distress financing along with change in poverty head count due to OOP expenses.

2. Method

This cross-sectional study was conducted among hospitalized patients with CLD. Patients were enrolled from two healthcare institutions, namely; Bangabandhu Sheikh Mujib Medical University (BSMMU), only medical university in Bangladesh and Dhaka Medical College Hospital (DMCH), the largest medical college hospital in Bangladesh. The institutions were chosen due to the high volume of patients seeking healthcare services there. Patients were enrolled for the study from the gastroenterology and hepatology departments of these two hospitals for the duration of April 2019 to September 2019. A total of 107 patients were enrolled matching the selection criteria during the six months of data collection. Selection criteria included hospitalized and already diagnosed cases of chronic liver disease patients. Patients diagnosed with chronic hepatitis-B, chronic hepatitis-C and liver cirrhosis were considered eligible for enrolment in the study. Each patient was interviewed once, using a pretested semi-structured questionnaire during their discharge from the hospital. During interview, detailed socio-demographic and socio-economic data such as age, sex, religion, residence, education, occupation, monthly household income and source of healthcare expenses were taken. Also, data on diagnosed disease, duration of diagnosed disease, duration of hospital stay, number of hospitalizations in last six months and bed type during hospital stay were taken.

Data on expenses for investigations, medical supplies, medicines, blood transfusion and bed rent were collected and used to calculate direct medical expenses. Data on expenses for travel and dietary needs of the patients were collected and used to calculate direct non-medical expenses. Data on unofficial payments and expenses for travel and dietary purposes of the attendants were taken and had calculated as indirect expenses. Combining the direct medical expenses, direct non-medical expenses and indirect expenses gave us the total out-of-pocket expenses. The prevalence of catastrophic health expenditure (CHE), distress financing and impoverishment due to OOP expenses were calculated. CHE was defined as any OOP expenses on healthcare exceeding 10% of total yearly income of the household. CHE was also estimated up to 40% cut-off value at every 5% interval. Distress financing was defined by when a household borrowed money or sold property to meet the OOP expenses for health care. Impoverishment was estimated by the number of poverty headcount before and after the OOP expenses for health care, using the international poverty line.

Statistical analyses were carried out by using Statistical Package for Social Sciences version 25.0 for Windows. Prior to the study, necessary ethical clearance was sought from the Institutional Review Board of National Institute of Preventive and Social Medicine (NIPSOM) and concerned authorities of Bangabandhu Sheikh Mujib Medical University (BSMMU) and Dhaka Medical College Hospital (DMCH). In addition, participants' written consent was taken before collecting the data.

3. Results

Table 1: Socio-demographic and economic factors of study population (n = 107)

Criteria	N = 107 (100%)	OOP Expenses (In BDT) Mean (95% CI)	Significance
Age Group in Years			
18 – 29	5 (4.7)	28,398 (8,230-48,566)	
30 – 44	26 (24.3)	17,343 (12,984-21,702)	
45 – 59	51 (47.7)	22,296 (16,789-27,803)	0.056[a]
≥ 60	25 (23.4)	13,240 (9,724-16,756)	
Sex			
Male	69 (64.5)	19,900 (15,702-24,098)	0.578[b]
Female	38 (35.5)	18,102 (13,943-22,262)	
Housing Status			
Rural	76 (71)	19,293 (15,405-23,180)	0.975[b]
Urban	31 (29)	19,185 (14,421-23,950)	
Education			
Illiterate	16 (15)	17,427 (11,857-22,997)	
PSC	48 (44.9)	21,431 (15,482-27,381)	0.684[a]
SSC	19 (17.8)	14,667 (9,786-19,548)	

HSC	16 (15)	18,303 (12,847-23,759)	
Graduate	5 (4.7)	22,110 (2,144-42,076)	
Honors	3 (2.8)	23,800 (2,599-45,001)	
Occupation			
Senior Official	4 (3.7)	13,300 (1,180-25,420)	
Professional	4 (3.7)	26,375 (317-53,067)	
Technician	5 (4.7)	9,580 (4,727-14,433)	
Clerk	3 (2.8)	27,717 (10,887-44,547)	
Skilled Worker	5 (4.7)	39,540 (5,732-84,812)	0.169[a]
Agricultural Worker	8 (7.5)	17,679 (8,622-26,735)	
Craft and Related Trade Worker	25 (23.4)	18,383 (11,011-25,755)	
Industry Worker	6 (5.6)	20,700 (6,569-34,831)	
Elementary Occupation	7 (6.5)	16,743 (664-32,822)	
Unemployed	40 (37.4)	18,279 (14,357-22,200)	
Total Monthly Income of the Family (In BDT)			
46,800 – 93,596	5 (4.7)	18,700 (4,908-42,308)	
35,010 – 46,799	9 (8.4)	21,408 (13,385-29,432)	
23,399 – 35,009	27 (25.2)	20,962 (15,669-26,255)	0.719[a]
14,038 – 23,398	37 (34.6)	20,378 (13,507-27,249)	
4,685 – 14,037	29 (27.1)	15,684 (11,156-20,213)	
Socioeconomic Status			
Upper Middle	61 (57)	20,033 (15,464-24,601)	
Lower Middle	32 (29.9)	18,600 (13,722-23,479)	0.826[a]
Lower	14 (13.1)	17,413 (10,427-24,398)	
Source of Healthcare Expenditure			
Household savings	69 (64.5)	18,197 (14,473-21,922)	
Loan from relatives	21 (19.6)	22,913 (13,735-32,090)	0.496[a]
Donation or charity	17 (15.9)	19,071 (13,423-24,718)	
Diagnosis			
Liver Cirrhosis	52 (48.6)	23,114 (17,878-28,350)	
Chronic Hepatitis-B	44 (41.1)	13,863 (10,710-17,016)	<0.05[a]
Chronic Hepatitis-C	11 (10.3)	22,645 (13,329-31,960)	
Duration of Diagnosed Disease			
Up to 6 months	87 (81.3)	18,208 (15,128-21,288)	
6 months to 1 year	11 (10.3)	21,413 (14,045-28,781)	0.272[a]
More than 1 year	9 (8.4)	26,817 (4,174-49,459)	
Duration of Hospital Stay			
Up to 1 week	68 (63.6)	12,745 (10,576-14,914)	
1 to 2 weeks	35 (32.7)	26,378 (22,520-30,236)	<0.001[a]
More than 2 weeks	4 (3.7)	67,775 (17,251-118,299)	
Number of Hospitalization in Last 6 Months			
1	92 (86.0)	19,290 (15,856-22,723)	0.964[b]
≥ 2	15 (14.0)	19,090 (12,885-25,295)	
Bed Type			
Non-Paying bed	85 (79.4)	18,946 (15,393-22,499)	0.688[b]
Paying bed	22 (20.6)	20,482 (14,416-26,547)	
Study Place			
Medical university	79 (73.8)	20,196 (16,249-24,144)	0.309[b]
Medical college hospital	28 (26.2)	16,625 (13,063-20,187)	
Total	107 (100)		

a = One-way ANOVA, performed to check association with out of pocket payments

b = Independent Samples T-test, performed to check association with out of pocket payments

P < 0.05 is considered statistically significant.

Total 107 hospitalized CLD patients matching selection criteria were enrolled for the study. Nearly half of the hospitalizations were due to liver cirrhosis (48.6%) as shown in **Table 1**, followed by chronic hepatitis-B (41.1%). Statistically significant (p < 0.05) relation between disease type and the amount of OOP expenses were found. Study population were predominantly male (64.5%), aged 45 to 59 years (47.7%), Muslim (91.6%), from

rural areas (71%), completed primary education (44.9%), unemployed (37.4%) and according to "Modified Kuppuswamy Socioeconomic Scale" (Saleem, 2019) from Upper middle socioeconomic class (57%). Mean age of the respondents were 49.15 years and mean years of education was 7.98 years. Average monthly family income was BDT 21,822 and average monthly family expense was BDT 17,915. Mean duration for diagnosed disease was 7.07 months and mean duration for hospital stay was 6.99 days. Majority (81.3%) of the respondents had their disease diagnosed within last 6 months of the admission, 63.6% stayed up to one week in hospital and 86% were admitted in the hospital for the first time in past 6 months. More commonly patients were staying in non-paying bed (79.4%) and were from medical university (73.8%).

OOP expenses and its determinants-

Table 2: Distribution of healthcare expenses

Healthcare Expenses	Mean (95% CI)	% OOP Expenses
Direct Medical Cost (in BDT)		
Cost for investigation	9,338 (7,824 – 10,852)	48.48%
Cost for medical supplies	350 (280 – 421)	1.82%
Cost for drugs	6,128 (4,460 – 7,796)	31.81%
Cost for blood transfusion	75 (23 – 127)	0.39%
Cost for bed or cabin	348 (203 – 493)	1.81%
Total	16,240 (13,494 – 18,987)	84.31%
Direct Non-Medical Cost (in BDT)		
Cost for travel to hospital	1,387 (1,053 – 1,720)	7.20%
Cost for food and drinks	777 (638 – 917)	4.03%
Total	2,165 (1,783 – 2,547)	11.24%
Indirect Cost (in BDT)		
Unofficial payment on admission	26 (8 – 44)	0.13%
Unofficial payment for bed	40 (17 – 63)	0.21%
Unofficial payment for wheelchair	12 (4 – 20)	0.06%
Cost of food or drinks for attendant	990 (853 – 1126)	5.14%
Cost of travel for attendant	443 (263 – 623)	2.30%
Total	1,510 (1,304 – 1,718)	7.84%
Total Out of Pocket Expenses	19,262 (16,216 – 22,307)	100%

Mean direct medical cost was estimated to be BDT 16,240, which constituted 84.31% of the total OOP expenses **(Table 2).** Cost for investigation and drugs were the major contributor in the OOP expenses, 48.48% and 31.81% respectively. Mean direct non-medical cost was estimated to be BDT 2,165, which was 11.24% of the OOP expenses. Mean indirect cost was estimated to be BDT 1,510, which was 7.84% of the OOP expenses. Total OOP expenses were estimated to be BDT 19,262.

Distress financing-

The prevalence of distress financing for hospitalization due to OOP expenses for CLD was found to be 64.5%, 19.6% borrowed and 15.9% received money in the form of donation and charity from others to meet the OOP expenses **(Table 1).**

Catastrophic Health Expenditure (CHE)-
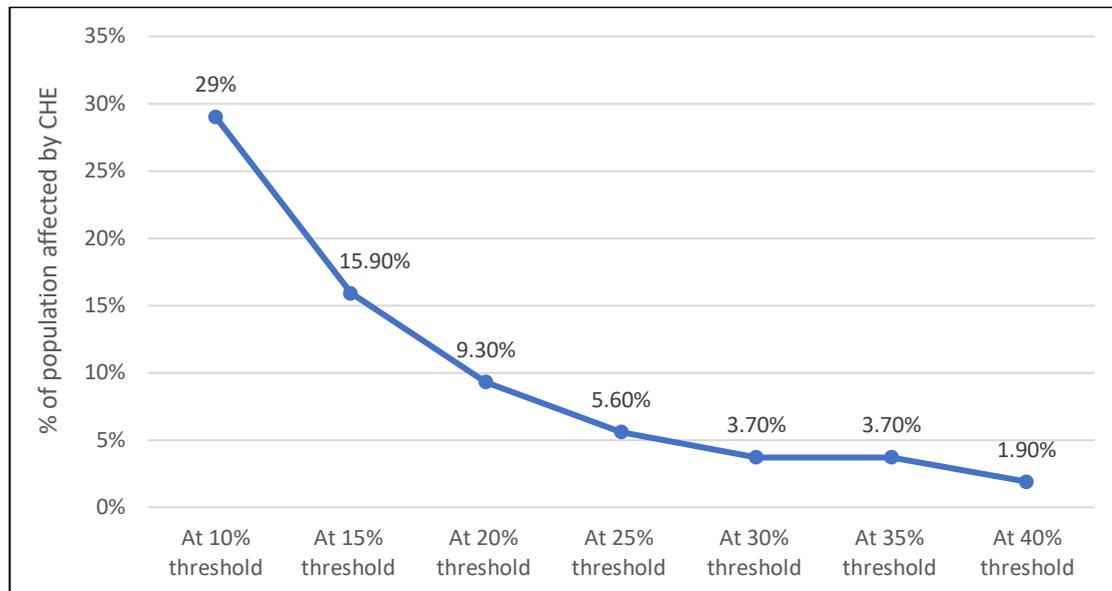
Figure 1: Catastrophic Health Expenditure at different cut-off values

The prevalence of catastrophic health expenditure for hospitalization due to CLD at 10% cut-off value was 29%. The prevalence of CHE decreased to 15.9% at 15% cut-off value and steadily decreased when cut-off value was increased, reaching 1.9% at 40% cut-off value, as shown in **Figure 1.**

Impoverishment-
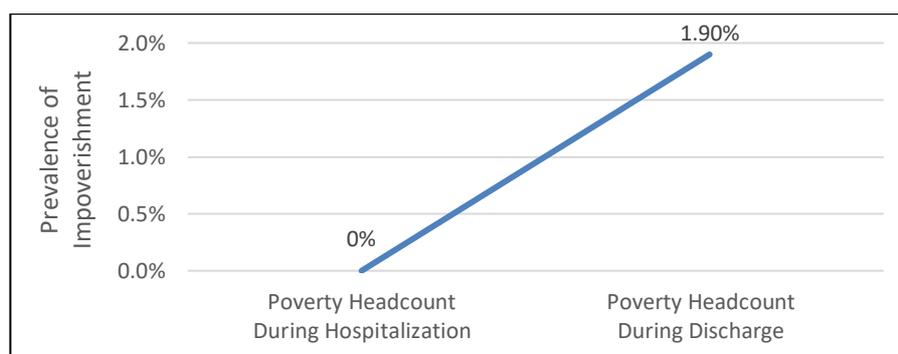
Figure 2: Poverty headcount before and after Out-of-Pocket expenses

Poverty head count as a result of OOP expenses due to hospitalization for CLD treatment was 1.9%. Before the hospitalization, no respondent was below the international poverty line, but after the OOP expenses incurred during the treatment, 1.9% of the study population fell below international poverty line **(Figure 2).**

4. Discussion

Chronic liver disease (CLD) is a major non-communicable disease in Bangladesh (Rahman et al., 2014; Islam & Biswas, 2014). The present study was conducted to identify economic impact of CLD in terms of out-of-pocket expenses, and prevalence of distress financing, catastrophic health expenditure and impoverishment due to hospitalization for CLD. Overall OOP expenses for hospitalization was estimated to be BDT 19,262. This study was conducted in two different hospitals, one was medical college hospital, and another was a medical university hospital. No significant difference was observed between the two centers in terms of money spent as OOP expenses (Table 1). The prevalence of distress financing was 64.5%, prevalence of catastrophic health expenditure was 29% at 10% cut-off value and 1.9% at 40% cut-off value. About 1.9% slipped below poverty line due to OOP expenses.

For this study, 107 patients were enrolled. With a 17.3% prevalence of Institutionalized care-seeking behavior for the Bangladeshi population (Rahman, Gilmour, Saito, Sultana & Shibuya, 2013), finding patients who match the selection criteria was difficult. The study population in the present study was predominantly male and aged 45 to 59 years. Prior studies have shown a higher prevalence of CLD in the population over 40 years (Rahman et al., 2014; Sajja, Mohan & Rockey, 2014; Kim, Kisseleva & Brenner, 2015), and in Bangladesh, there was male dominance (67.9%) among CLD patients (Rahman et al., 2014). The current study found that about three-quarters (71%) of respondents came from rural areas, which is consistent with previous public hospital-based research in Bangladesh (Pavel, Chakrabarty & Gow, 2016; Mahumud et al., 2017). This reflects the predominance of rural health seekers in government hospitals in Bangladesh

In regards to OOP expenses, the amount of money spent by the population of the current study was a little bit higher (BDT 2,695) than a research conducted among the urban Bangladeshi population in 2020 (Rahman et al.,2020). The selection criteria between the participants in the two studies may be the reason behind this difference. The present study enrolled the study population from a pool of hospitalized patients at a medical college hospital and a medical university, with access to patients from all over the country, whereas Rahman et al. (2020) selected study population was only from urban households and took under consideration the amount of health expenses in last 30 days. In contrast, the running study took into account the expenses for the entirety of the duration of the hospitalization, yielding a higher OOP expense. Moreover, only patients with CLD were selected as participants in the present study, which usually requires further administration of investigation and medication, generally contributing to higher OOP costs (Weersink et al.,2019). However, compared to the neighboring country, such as India, the OOP expense for hospitalized patients with liver disease was found to be INR 17,794 (Kastor & Mohanty, 2018) (equivalent to BDT 22,627; using the average exchange rate in 2014, BDT 1 = INR 0.7864).

Among the OOP expenditure, the purchasing of medicine was found to be responsible for 31.81% which was the second biggest contributor to the total OOP expenses after cost for investigations of 48.48%. This is probably due to the disease management nature of the population in our study as hospitalized CLD patients require full and comprehensive investigation, and the cost of investigation is much higher in Bangladesh (Sarin et al., 2019). In previous studies (Prinja, Bahuguna, Duseja, Kaur & Chawla, 2018; Mahumud et al., 2017; Tahsina et al., 2017), cost for medicine and investigation were found to be the most distinctive feature of OOP expenses, contributing up to 62% of healthcare expenses.

Catastrophic health expenditure in the current study is found to be lower than Rahman et al. (2020) study (Rahman et al., 2020), 1.9% and 12.3% respectively, both at 40% cut-off value. Socio-demographic conditions play an important role in the variability of the results of these two studies as only 0.9% of the population in the present study belonged to the lower-socio-economic class and the others to the middle or upper-lower class according to the modified Kuppuswamy socio-economic scale of 2019 (Saleem, 2019), which indicates a higher capacity to spend behind healthcare and is less affected by catastrophic health expenditure. In contrast, at 10% cut-off values, the CHE in the current study was 29% which is 51% lower than in previous studies in liver patients in India (Kastor & Mohanty, 2018), this result is usually due to differences in sample size and criteria of the two studies. A prior study from Bangladesh showed the prevalence of CHE to be 14.2% at a 10% cut-off value (Khan, Ahmed & Evans, 2017) among the general population, which is considerably lower than the present study finding. Payments for inpatient care exceed 10% of total household expenditure for around 30% of hospitalized households. On the other hand, an India based nationally representative study showed a 10% cut-off level prevalence of CHE to be 30%, which is almost identical to the running study findings (Flores, Krishnakumar, O'Donnell & van Doorslaer, 2008). A retrospective observational study of health spending using data of household surveys in 133 countries between 1984 and 2015 found that the global incidence of catastrophic spending at the 10% threshold was 9.7% in 2000, 11.4% in 2005, and 11.7% in 2010 due to OOP expenditures (Wagstaff et al.2018), which is lower than the current study findings.

Prevalence of distress financing was higher in current study than previous study among liver disease patients in Bangladesh (Rahman, Gilmour, Saito, Sultana & Shibuya, 2013). But the difference between these two studies became much smaller when the current study finding was compared to the prevalence of distress financing among the general population (Rahman, Gilmour, Saito, Sultana & Shibuya, 2013). Previous study showed the

prevalence of distress financing for hospitalized patients with liver disease to be 29.4% (Kastor & Mohanty, 2018) which is closer to the current study, and 49% for hospitalized CLD patients needing intensive care (Prinja , Bahuguna, Duseja, Kaur & Chawla, 2018) which is substantially higher than this study finding. In terms of borrowing money to meet OOP expenses, a controversial finding has observed in the present study as previous studies had found both higher and lower percentages of participants than the current study in this regard (Prinja, Bahuguna, Duseja, Kaur & Chawla, 2018; Flores, Krishnakumar, O'Donnell & van Doorslaer, 2008).

This study population showed the prevalence of impoverishment to be 1.9% due to OOP expenses for hospitalized CLD patients, substantially lower than the 3.5% found in previous study from Bangladesh (Khan, Ahmed & Evans, 2017). Compared to the present study, prevalence of impoverishment due to OOP expenses was found to be considerably higher than 1.9% reaching up to 11.40% in other countries (Khammarnia, Keshtkaran, Kavosi & Hayati, 2014; Arenliu Qosaj, Froeschl, Berisha , Bellaqa & Holle, 2018).

5. Limitations of the study

Patients and their attendants were asked about family income for past one year, while they did answer the study questions, there was a possibility of recall bias. Study samples were enrolled only from two hospitals and both are tertiary hospitals, acting as referral centers for other hospitals. Some of the patients received partial treatment at other facilities prior to getting admitted in one of these two hospitals and OOP expenses for that period was not recorded in this study. This might have resulted in an understatement of the overall OOP expenses than reported in this study. Since this study only included hospitalized cases, we were unable to estimate the cost of ambulatory care for CLD patients.

6. Conclusion

The financial burden of chronic liver disease among hospitalized patients is substantial for all socio-economic groups. Decentralization of healthcare facilities from center to periphery could reduce the need for travel to hospitals and shorten the duration of hospital visit, reducing the direct non-medical cost. Expenses for medicine and investigations are the biggest driver for high OOP expenses. Ensuring equitable and affordable access to medicine and medical investigations, especially from government healthcare facilities may reduce the direct medical expenses. This study showed the presence of unofficial payment in tertiary hospitals. By strengthening hospital administration and through proper workplace discipline, unofficial payments could be minimized, and indirect expenses for healthcare could be decreased which may further reduce OOP expenses. Results obtained from this study could be used as a basis for future study with a larger sample size from multiple hospitals of different tire from both public and private hospitals. Policy makers could utilize these findings to implement health policies to enable financial risk protection for economically vulnerable population, minimizing OOP expenses for health, thus minimizing the prevalence of CHE, distress financing and impoverishment.

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Arrhythmias in Children with Normal Heart in Albaha, Saudi Arabia

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Abstract
Introduction: Arrhythmias in children with structurally normal hearts are common and reported as the causes of many hospital admissions. Generally, the risk of death is low. Physical examination is important in children with arrhythmias. Objectives: This study aimed to review the common types and clinical presentations of arrhythmias in children with normal heart structures in Albaha, Saudi Arabia. Methodology: In this hospital-based retrospective cross-sectional study, the medical records of children were reviewed from January 2010 to December 2020. Results: Overall, 214 children were included in this study. The prevalence of arrhythmias was 27.10% in children aged 5-8 years; 18.7%, 8-12 years; 16.82%, 3-5 years; 16.35%, 1-3 years; 13.55%, 12-14 years; and 7.48%, <1 year. Arrhythmias were more frequent in females aged <5 years and in males aged >5 years; however, overall, there was no significant difference between females (47.20%) and males (52.80%). Supraventricular arrhythmias were the commonest and found in 85% of the children and ventricular arrhythmias were found in 15%. Sinus tachycardia was the most common type of arrhythmia, reported in 25% of the children. Conclusion: In general, arrhythmias in the children are asymptomatic. History, clinical examination, and electrocardiography are important for the diagnosis. Supraventricular arrhythmias are the most common. There is no significant difference between females and males with respect to the prevalence of arrhythmias.

Keywords: Children, Arrhythmias, Normal Heart Structure

Abbreviations:
ECG: electrocardiography. PACs: premature atrial contractions. PVCs: premature ventricular contraction. SVT: supra ventricular tachycardia. VT: ventricular tachycardia. WPW: Wolff Parkinson white syndrome. LQT: long QT interval. AV: atrioventricular. SVT: Supraventricular tachycardia. CXR: chest x-ray. P value: probability of chance.

Introduction

Arrhythmias in children with structurally normal hearts are common and reported as the causes of many hospital admissions. Generally, the risk of death due to arrhythmias is low [John M Miller, Douglas P Zipes. Braunwald's Heart Disease 2015]. Physical examination is important in children with arrhythmias. Congestive heart failure is the typical presentation in neonates and infants, while chest pain, tachycardia, palpitations, and syncopal attacks are the common signs and symptoms in older children [Emily Anne Schlechte et al 2008]. Supraventricular tachyarrhythmias with aberrant pathways such as in Wolff-Parkinson-White (WPW) syndrome and junctional tachycardia are the most common arrhythmias [Niwa K. Warita N et al 2004]. Supraventricular arrhythmias are often asymptomatic, accidentally diagnosed in most children, and respond well to treatment [Reena M Ghosh et al 2014]. Delayed diagnosis of arrhythmias can lead to serious consequences necessitating treatment for a long time; ablation is needed to resolve them in some cases [Martial M Massin et al 2008]. Supraventricular tachycardia (SVT) is categorized into two types, non-sustained and sustained, and has an incidence of about 1 per 25000 [Schlechte EA, Boramanand N, et al 2008]. Sudden cardiac death has been reported in children and infants have arrhythmias with normal hearts, and 5% of the cases had findings of WPW syndrome on electrocardiography (ECG); ablation should be considered in such cases [Gregory Webster, Rachael Olson, et al 2019]. Hypertrophic obstructive cardiomyopathy and Ebstein's anomaly may be associated with WPW syndrome [Lu CW, Wu MH et al 2014]. Bradyarrhythmias are rare in children and generally asymptomatic. First-degree heart block, recorded on ECG as a PR interval prolongation 0.2 seconds and more, is considered a benign finding in children with a prevalence of about 1%; although uncommon, it can be complicated by atrial fibrillation [Cheng S, Keyes MJ et al 2009- Zhi Du, Liying Xing, et al 2019]. The incidence of sudden death in children is about 0.8-6.2 per 100000 live births and 65% of these deaths result from cardiac causes [Robert M. Kliegman, MD, Nelson Textbook of Pediatrics 20th edition 2016]. The incidence of long QT syndrome is about 1 per 10000 live births, with a genetic cause in 80% of the cases; it can also be present in children with hypertrophic cardiomyopathy, electrolytes disturbance, and due to some medications [Robert M. Kliegman, MD, Nelson Textbook of Pediatrics 20th edition 2016]. Long QT interval is always a serious finding, and sudden death can happen in some cases. Some children have a positive family history for such illnesses; therefore, it is important and necessary to record a detailed history [Nabil El-Sherif et al 2017]. A complete heart block is rare in children, with an incidence of 1 per 20000-25000 live births; autoimmune causes have been noted in 60-70% of the cases, and the mortality is high (3.5%) when the diagnosis is delayed [Friedman D, Rupel A2002]. Premature ventricular complexes (PVCs) reported on ECG in children frequently and may be asymptomatic in 2.2% of children with heart disease [Mitchell I Cohen 2019].

Objectives

The present study aimed to review the prevalence, common types, and clinical presentations of arrhythmias in children with normal heart structures in Albaha, Saudi Arabia.

Methodology

In this is hospital-based retrospective cross-sectional study, medical records of children were reviewed from January 2010 to December 2020. The study was conducted in the pediatric and neonatology department of King Fahad Hospital, Albaha, Saudi Arabia. The sample size was calculated using the Leslie Kish formula [Jon Wiley, Sons INC 2004]. Records of 214 children, aged 1 day to 14 years, reported to have arrhythmias with normal hearts were reviewed. All children had been evaluated by pediatric cardiologists and had undergone physical examination, ECG, and echocardiography. Children having arrhythmias with associated congenial heart diseases were excluded. Statistical analysis was performed using Microsoft Excel 2020. Prevalence, types of arrhythmias, the age, and sex of the children were evaluated as various factors of interest affecting the course and presentation of arrhythmias. Laboratory workup, mainly serum electrolytes level, was performed for all cases. In this study, we considered the average normal heart rate related to age as 94-180 beats/minute in children aged 1-30 days; 120-179 beats/minute, 1-3 months; 105-185 beats/minute, 3-6 months; 108-169 beats/minute, 6-12 months; 89-152 beats/minute, 1-3 years; 73-137 beats/minute, 3-5 years; 65-133 beats/minute, 5-8 years; 62-130 beats/minute, 8-12 years; and 60-120 beats/minute, 12-16 years. Arrhythmia was said to be present when the difference between the minimal and maximal duration of a heart rate was more than

10%, as mentioned in the literature [Allen, Hugh D.; Driscoll, David J.; Shaddy, Robert E, Moss, Adams2008]. Probability of chance (P value) was calculated as significant statistical value for our results,

Results

As shown in Table 1 and 2, the groups were categorized by age. The total number of children included in this study was 214. In a decreasing order, the prevalence of arrhythmias was 27.10% (58/214) in children aged 5-8 years; 18.7% (40/214), 8-12 years; 16.82% (36/214), 3-5 years; 16.35% (35/214), 1-3 years; 13.55% (29/214), 12-14 years; and 7.48% (16/214), <1 year. Arrhythmias were frequent in females (45/214) at <5 years of age and in males (71/214) at >5 years of age; however, overall, no significant difference was observed between females (101/214, 47.20%) and males (113/214, 52.80%) (overall P=0.12). Arrhythmias that originated above the atrioventricular node, supraventricular arrhythmias; sinus dysrhythmias, atrial arrhythmias, SVT, and premature atrial contractions (PACs) were more frequent than other types of rhythm disturbances and were found in 182/214 (85%) children, while ventricular arrhythmias were found in 32/214 (15%) children. Sinus tachycardia was the most common type of arrhythmia diagnosed in the study, accounting for 53 (25%) children, 33 (62%) males and 20 (38%) females. PAC was the second most common type of arrhythmia, reported in 34 (16%) children, 14 (41%) males and 20 (59%) females. Atrial tachyarrhythmias were confirmed in 29 children, 15 males and 14 females; sinus bradycardia in 26 children, 17 males and 9 females; SVT in 25 children, 11 males and 14 females; and first-degree heart block in 15 children, 7 males and 8 females. PVCs were seen in 14 children, 8 males and 6 females. Long QT interval was diagnosed in 9 children, 4 males and 5 females; genetic analysis was performed for them, and all patients were transferred to a higher center for further evaluation. WPW was diagnosed in 5 children, 2 males and 3 females. Ventricular tachycardia and second-degree heart block were diagnosed in 2 children each, 1 male and 1 female in each category. The presenting symptoms in children with SVT were chest pain (50%), shortness of breath (20%), and palpitations (20%). Heart failure and other signs were detected in 10% of cases. Majority of the children with PACs were asymptomatic. A total of 15 (7%) children had first-degree heart block, and 5 of them were on medications for no cardiac problems; no significant difference in occurrence of first degree heart block between males and females was observed (P=0.32). The outcome was excellent, and all children responded well to medical treatment. Children with WPW syndrome were transferred to a higher cardiac center for ablation. Chest x-rays were normal in 80% of the children, while mild cardiomegaly was noted in 20%.

Discussion

Tables 1 and 2 show the distribution of the reported cases of arrhythmias in the children included in this study. Medical records of 214 children were reviewed in this study. Mild differences were noted in the frequency of cardiac arrhythmias in all age groups. The prevalence of arrhythmias was higher in children aged 5-8 years (58/214, 27.10%). Sinus tachycardia had the highest prevalence in this study, and it was reported as the most common type of arrhythmia in all groups of children (P=0.05). A vegetative and immunological functional change in the sinus node and conductive tissues of the heart could explain that. This result was consistent with the results of other published national and international studies. Thus, we can call it a variant of cardiac rhythm and rate rather than dysrhythmias [Emily Anne Schlechte et al 2008, Niwa K. Warita N et al 2004]. Arrhythmias were more frequent in females under 5 years of age (45/214), while they were more frequent in males older than 5 years (71/214), with no overall significant difference between them (females 101/214, 47.20%; males 113/214, 52.80%; overall P=0.12). Arrhythmias that originated above the AV node, such as sinus tachycardia, sinus bradycardia, atrial arrhythmias, SVT, and PACs, were more frequent than other types of rhythm disturbances and were seen in 182/214 (85%) children, and dysrhythmias originating below the AV node were seen in 32/214 (15%) children. Sinus tachycardia was the most commonly diagnosed arrhythmia in this study, reported in 53 children (24.77%), 33 males (62%) and 20 females (38%). It was considered as a normal physiological response for many precipitating factors and associated diseases mentioned in the literature [Robert M. Kliegman, MD, Nelson Textbook of Pediatrics 2016]. Evaluation by clinical examination, ECG, and echocardiography was performed for all children to confirm the diagnosis. No medications were given and only the precipitating diseases were managed. PAC was the second most common type of arrhythmia, noted in 34 (16%) children, 14 (41%) males and 20 (59%) females. Most of children with PACs were asymptomatic. Atrial tachyarrhythmia was the third most common type of arrhythmia, noted in 29 (14%) children, 15 (52%) males and 14 (48%)

females. SVT was seen in 25 children, 11 (44%) males and 14 (56) females (P=0.09). A majority of the children responded well to medical treatment by intravenous adenosine as the treatment of choice. However, two children needed intensive care and DC shock. Children with PACs were asymptomatic. WPW syndrome was found in 5 (2.34%) children, 2 (40%) males and 3 (60%) females, and they presented with chest pain, palpitations, and SVT on ECG (P=0.36). Intravenous adenosine was administered as the treatment of choice with good response [Gregory Webster et al 2019, Lu CW, Wu MH et al 2014]. Patient with recurrent attacks were transferred to a higher cardiac center for ablation. Fifteen children (7%) were diagnosed with first-degree heat block, and 2 of these children were on digoxin and 5 on non-cardiac medications when the ECG findings were detected. There was no significant difference in occurrence of first-degree heart block between males and females (P=0.32). Second-degree heart block was reported in two children the study and completely investigated. PVC was diagnosed in 14 children, 8 (57%) males and 6 (43%) females. It was unifocal, and the children were stable and asymptomatic, fully investigated with normal laboratory results, and needed only parents' reassurance and observation (P=0.15). Long QT interval was diagnosed in 9 children, 4 (44%) males and 5 (56%) females. Genetic study was performed in all of them and the genetic cause was detected in 3 patients and considered as long QT syndrome. It was precipitated by some medications and electrolytes abnormalities in the other 6 children (P=0.72). Ventricular tachycardia was observed in 2 children with hyperkalemia, and it responded well to treatment. The results of the present study were consistent with other national and international studies on the same topic [John M Miller, Douglas P Zipes. Braunwald's Heart Disease 2015, Emily Anne Schlechte et al 2008].

Conclusion

Arrhythmias in children are frequently asymptomatic. They are a normal variation in a majority of cases. History, clinical examination, and ECG are important for the diagnosis. Supraventricular arrhythmias are the most common. Arrhythmias are more common in females under 5 year of age and in male children over 5 years of age, with no overall significant difference between the sexes.

Table1: Distribution of children with age group.

Age	Normal HR[19]	Pts No	percent	M	F	P Value
<12 m	95-180	16	7.48%	6	10	0.16
1-3 yr	89-152	35	16.35%	20	15	0.07
3-5 yr	73-137	36	16.82%	16	20	0.07
5-8 yr	65-133	58	27.10%	33	25	0.05
8-12 y	62-130	40	18.7%	24	16	0.06
12-14 yr	60-120	29	13.55%	14	15	0,34
total	bpm	214	100%	113	101	0.12
No: number of pts. P Value: probability of chance. M: male. F: female. HR; heart rate. Pbm; beat per minute.						

Table2: Distribution of arrhythmias type by group.

ECG findings	< 12 m	1-3 y	3-5 y	5-8 y	8-12 y	12-14y	total	M	F	P value
Sinus tachycardia	4	10	11	11	10	7	53	33	20	0.05
PACs	5	5	4	10	5	5	34	14	20	0.06
Atrial Tachyarrhythmias	2	6	4	7	7	3	29	15	14	0.12
Sinus bradycardia	2	4	5	8	3	4	26	17	9	0.07
SVT	1	3	7	6	5	3	25	11	14	0.09
Heart block 1st degree	0	1	2	6	2	4	15	7	8	0.32
PVCs	1	1	2	4	3	3	14	8	6	0.15

LQT	1	3	0	3	2	0	9	4	5	0.72
WPW	0	2	0	1	2	0	5	2	3	0.36
VT	0	0	1	1	0	0	2	1	1	0.43
Heart block 2nd degree	0	0	0	1	1	0	2	1	1	0.43
Total children	16	35	36	58	40	29	214	113	101	0.12

ECG: electrocardiography. PACs: premature atrial contractions. PVCs: premature ventricular contraction. SVT: supra ventricular tachycardia. VT: ventricular tachycardia. WPW: Wolff Parkinson white syndrome. LQT: long QT interval. P value: probability of chance. HR; heart rate.

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Knowledge, Perception, Behavior and Practice Among University Students of Public Health Towards Obesity

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Abstract

Background: Overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk factor to health. A crude population measure of obesity is the body mass index (BMI), which is used to classify weight status, overweight is the person with a BMI of 25 or more, while a person with a BMI equal to or more than 30 is considered obese. Objectives: The aim of the study was to assess public health students' perception on obesity &overweight health risks, clarify students' knowledge, behaviors and practices that increases risks of obesity and obesity-related diseases. Methods: A cross-sectional study was conducted to evaluate students Knowledge, Perception, Behavior and Practices towards obesity among students of public health in Umm Al-Qura University, in which 50% of students (136)were randomly selected using stratified sampling technique. Results: The study clarified that (69.9%) of students understand BMI-obesity relationship, while (30.9) didn't know, the study showed that among 136 students,124 (91.2%) understand obesity -diabetes mellitus type 2 relationships. Likewise, 112 (82.4%) understand the relationship between obesity and hypertension. The study found that out of 136 students (72.8%) are aware that obesity is a risk factor for sleep apnea, referring t student's practice of physical activity, study clarified that only 69.9%of students were practicing physical activity. Conclusion: The study concluded that there was a weakness in the perception and knowledge of students on BMI, study recommended for more concentration in academic activities to change this perception. The study concluded that the knowledge of students on major risk factors of obesity, relations of obesity with diabetes mellitus type 2, hypertension, sleep apnea, physical activity and weight control where acceptable. According to the study there were a problem in monitoring blood glucose and hypertension among overweight and obese students, which may be reflected in other health problems in the future. Recommendations: The study recommends for the introduction of extra educational and non-curricula programs on lifestyle, nutrition and obesity for public health student's, establishment of regular physical activities programs and strengthening of health education programs on overweight, obesity and other associated health problems inside and outside university campus. The study recommends for more researches to evaluate knowledge, perception, practice among public health and other students towards obesity.

Keywords: Obesity, Public Health Students

Introduction

Overweight and obesity are defined as abnormal or excessive fat accumulation that presents a risk to health. A crude population measure of obesity is the body mass index (BMI), a person's weight (in kilograms) divided by

the square of his or her height (in meters). A person with a BMI of 30 or more is generally considered obese. A person with a BMI equal to or more than 25 is considered overweight. Overweight and obesity are major risk factors for a number of chronic diseases, including diabetes, cardiovascular diseases and cancer. Once considered a problem only in high-income countries, overweight and obesity are now dramatically on the rise in low- and middle-income countries, particularly in urban settings (WHO, 2019).

Obesity is a complex disease involving an excessive amount of body fat. Obesity isn't just a cosmetic concern. It is a medical problem that increases your risk of other diseases and health problems, such as heart disease, diabetes, high blood pressure and certain cancers. There are many reasons why some people have difficulty avoiding obesity. Usually, obesity results from a combination of inherited factors, combined with the environment and personal diet and exercise choices. The good news is that even modest weight loss can improve or prevent the health problems associated with obesity. Dietary changes, increased physical activity and behavior changes can help you lose weight. Prescription medications and weight-loss procedures are additional options for treating obesity (MOH, 2013).

Obesity and Overweight are defined as an increase in body mass, particularly fatty mass, which is caused by an imbalance between the energy consumed from food. The body consumes energy, and the World Health Organization defines (overweight) as the condition in which the body mass index is between 25 kg / m2 to 29.9 kg / m2, and (obesity) is defined as the case where the body mass index is more than 30 kg / M 2. More than 1.4 billion adults are overweight, more than half a billion are obese globally, and more than 40 million children under the age of five are overweight worldwide, according to WHO reports. Reports also show that the rate of obesity has doubled from 1980 to 2008 globally. Obesity has taken on epidemic proportions around the world, with it, and overweight, standing behind the deaths of at least 2.6 million people every year (Mayo Clinic, 2019).

Objectives

1. To assess students' perception on obesity& overweight and their health risks.
2. To clarify students' knowledge about Obesity-related diseases.
3. To assess the availability of health education materials on obesity.
4. To clarify behaviors and practices increasing risks of Obesity.

Literature Review

Obesity is regarded as a significant public health issue, which has raised a concern globally. The WHO claims that, obesity has more than doubled worldwide, since 1980. More than 1.9 adults were overweight, in the year 2014, including over 600 million obese individuals. 39% of the adults were overweight and 14% were obese. Moreover, it is found that 41 million children (under age 5) around the world in 2014 were either overweight or obese. Previous studies have revealed that obesity is among the major cause of co-morbidities, including cardiovascular diseases, diabetes, cancers, and the related issues that may lead to morbidity and mortality. In most of the countries, the high total obesity and overweight cost represents a relative economic burden on the GDP. Over the last decade, the prevalence of obesity has increased significantly in several developed and developing countries. The current research paper focuses on obesity in Saudi Arabia, which has now one of the highest obesity and overweight prevalence rates (Imedpub, 2016).

Sabra examine obesity among female nursing students in Dammam, Saudi Arabia using waist to hip ratio (WHR) and body mass index (BMI). The study collected data with the help of an interviewer-administered questionnaire, from a sample of 260 female nursing students. The results of the study indicate the dietary pattern and life style, according to which 71.5% of the respondents do not share family members in their meals, 46.9% watch television while eating, and 35.7% take snacks as their main eating pattern. In addition, 82.7% of the students consume fast/junk food 1 to 6 times/week and 73.1% consume soft drinks more than 7 times/week. According to the BMI results, almost half of the

students (51.5%) have normal weight; and 23.1% and 3.8% are overweight and obese respectively. It is also found that 19.2% of the respondents are underweight. 33% have abnormally unacceptable WHR, which is more prevalent among those who are found overweight by BMI. It is also observed that family history is significantly associated with prevalence of obesity in female nursing students Imedpub, 2016).

It is argued that data on obesity-related to Kingdom of Saudi Arabia (KSA) is non-existent, which restrained evaluation of government efforts in controlling obesity trends in the country. In this regard, Memish et al. conducted a national survey to examine obesity and its associated factors in KSA; and in the process, interviewed 10,735 individuals aged 15 years and older. The research collected data regarding physical activities, diet, health-related behaviors and habits, socio-demographic characteristics, anthropometric measurements, use and access to healthcare, and chronic diseases of the respondents using computer-assisted personal interviews. The results reveal that 28.7% of the total respondents are obese, with a BMI greater than 30 kg/m2, which is more prevalent among women (33.5%) than men (24.1%). Obesity, among men is associated with diet, marital status, hypertension, hypercholesterolemia, diagnoses of diabetes, and physical activity. Among women, it is related with education, marital status, hypertension, and chronic diseases' history (Imedpub, 2016).

In many developing societies, high caloric intake, decreased physical activity, and adoption of western lifestyle are contributing toward the prevalence of obesity. In addition, genetic factors also influence obesity and are related to BMI. Obesity has become an epidemic at global level, and widely regarded as a public health problem. Due to its related diseases, it is considered as major concern in KSA and other gulf states. In the context of KSA, examine association between obesity (BMI), fat mass and obesity-associated gene (FTO), glucose, and other metabolic-related traits. The study uses data of 186 female preparatory students of a university, and finds that one-third of the students have a high glucose level (HGL), and one-tenth are non-obese. Moreover, 50% of the students with Tallele have heterozygous FTO (Imedpub, 2016).

According to Horaib et al., obesity is a heritage of modernization of society. It involves faulty dietary habits, unhealthy food, less physical activity, and increased stress. In the Middle Eastern countries, these changes are drastic in the last four decades. The daily per capita consumption, during this period, has increased by 143.3% in the KSA. Moreover, the consequences are evident with the significant increase in prevalence and incidence of lifestyle-related diseases, which include ischemic heart diseases, diabetes, and hypertension [10], in the context of obesity, conducted a nationwide study and covered all five KSA military regions. Using a random (multistage stratified) sample of 10,229 military personnel, the research finds that 40.9% of the respondents are overweight; 42% have central obesity and 29% are obese. On the basis of multivariate analysis, results reveal that education years, age, and family history (Imedpub, 2016).

What are obesity and overweight?

Overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health. Body mass index (BMI) is a simple index of weight-for-height that is commonly used to classify overweight and obesity in adults. It is defined as a person's weight in kilograms divided by the square of his height in meters (kg/m^2) (WHO, 2018).

Body mass index:

The body mass index (BMI) is used to classify individuals as underweight normal weight, overweight, or obese in this report. The BMI is a unit of measurement that describes an individual's weight in relation to height, and is calculated by dividing weight in kilograms by the square of the height in meters (kg/m2).

For adults, WHO defines overweight and obesity as follows:

1. Overweight is a BMI greater than or equal to 25.
2. Obesity is a BMI greater than or equal to 30.

BMI provides the most useful population-level measure of overweight and obesity as it is the same for both sexes and for all ages of adults. However, it should be considered a rough guide because it may not correspond to the same degree of fatness in different individuals (Imedpub, 2016).

For children under 5 years of age:

1. Overweight is weight-for-height greater than 2 standard deviations above WHO Child Growth Standards median; and
2. Obesity is weight-for-height greater than 3 standard deviations above the WHO Child Growth Standards median.

Children aged between 5–19 years

1. Overweight is BMI-for-age greater than 1 standard deviation above the WHO Growth Reference median.
2. obesity is greater than 2 standard deviations above the WHO Growth Reference median (WHO, 2018).

What causes obesity and overweight?

The fundamental cause of obesity and overweight is an energy imbalance between calories consumed and calories expended. Globally, there has been:

1. An increased intake of energy-dense foods that are high in fat.
2. An increase in physical inactivity due to the increasingly sedentary nature of many forms of work, changing modes of transportation, and increasing urbanization.

Changes in dietary and physical activity patterns are often the result of environmental and societal changes associated with development and lack of supportive policies in sectors such as health, agriculture, transport, urban planning, environment, food processing, distribution, marketing, and education (WHO, 2018).

Overweight is a significant contributor to health problems. It increases the risk of developing a number of diseases including:
Type 2 (adult-onset) diabetes high blood pressure (hypertension), Stroke (cerebrovascular accident or CVA), Heart attack (myocardial infarction or MI), Heart failure (congestive heart failure), Cancer (certain forms such as cancer of the prostate and cancer of colon and rectum), Gallstones and bladder disease (cholecystitis), Gout and gouty arthritis, Osteoarthritis (degenerative arthritis) of the knees, hips, and the lower back, Sleep apnea (failure to breath normally during sleep, lowering blood oxygen), Pickwickian syndrome (obesity, red face, under ventilation, and drowsiness) (Medicine net, 2017).

Risk factors for obesity:

Obesity usually results from a combination of causes and contributing factors, including:

Family lifestyle. Obesity tends to run in families. If one or both of your parents are obese, your risk of being obese is increased. That's not just because of genetics. Family members tend to share similar eating and activity habits.

Inactivity. If you have a sedentary lifestyle, you can easily take in more calories every day than you burn through exercise and routine daily activities. Looking at computer, tablet and phone screens is a sedentary activity. The number of hours you spend in front of a screen is highly associated with weight gain.

Unhealthy diet. A diet that's high in calories, lacking in fruits and vegetables, full of fast food, and laden with high-calorie beverages and oversized portions contributes to weight gain.

Medical problems. In some people, obesity can be traced to a medical cause, such as Prader-Willi syndrome, Cushing syndrome and other conditions. Medical problems, such as arthritis, also can lead to decreased activity, which may result in weight gain.

Certain medications. Some medications can lead to weight gain if you don't compensate through diet or activity. These medications include some antidepressants, anti-seizure medications, diabetes medications, antipsychotic medications, steroids and beta-blockers.

Social and economic issues. Research has linked Social and economic factors to obesity. Avoiding obesity is difficult if you don't have safe areas to exercise. Similarly, you may not have been taught healthy ways of cooking, or you may not have money to buy healthier foods. In addition, the people you spend time with may influence your weight — you're more likely to become obesity if you have obese friends or relatives.

Age. Obesity can occur at any age, even in young children. But as you age, hormonal changes and a less active lifestyle increase your risk of obesity. In addition, the amount of muscle in your body tends to decrease with age. Generally, lower muscle mass leads to a decrease in metabolism. These changes also reduce calorie needs, and can make it harder to keep off excess weight. If you don't consciously control what you eat and become more physically active as you age, you'll likely gain weight.

Pregnancy. Weight gain is common during pregnancy. Some women find this weight difficult to lose after the baby is born. This weight gain may contribute to the development of obesity in women.

Quitting smoking. Quitting smoking is often associated with weight gain. And for some, it can lead to enough weight gain that the person becomes obese. In the long run, however, quitting smoking is still a greater benefit to your health than is continuing to smoke.

Lack of sleep. Not getting enough sleep or getting too much sleep can cause changes in hormones that increase your appetite. You may also crave foods high in calories and carbohydrates, which can contribute to weight gain.[7]

Obesity worldwide

Worldwide obesity has nearly tripled since 1975, in 2016, more than 1.9 billion adults, 18 years and older, were overweight. Of these over 650 million were obese, 39% of adults aged 18 years and over were overweight in 2016, and 13% were obese, Most of the world's population live in countries where overweight and obesity kills more people than underweight, 41 million children under the age of 5 were overweight or obese in 2016, Over 340 million children and adolescents aged 5-19 were overweight or obese in 2016 and Obesity is preventable (WHO, 2018).
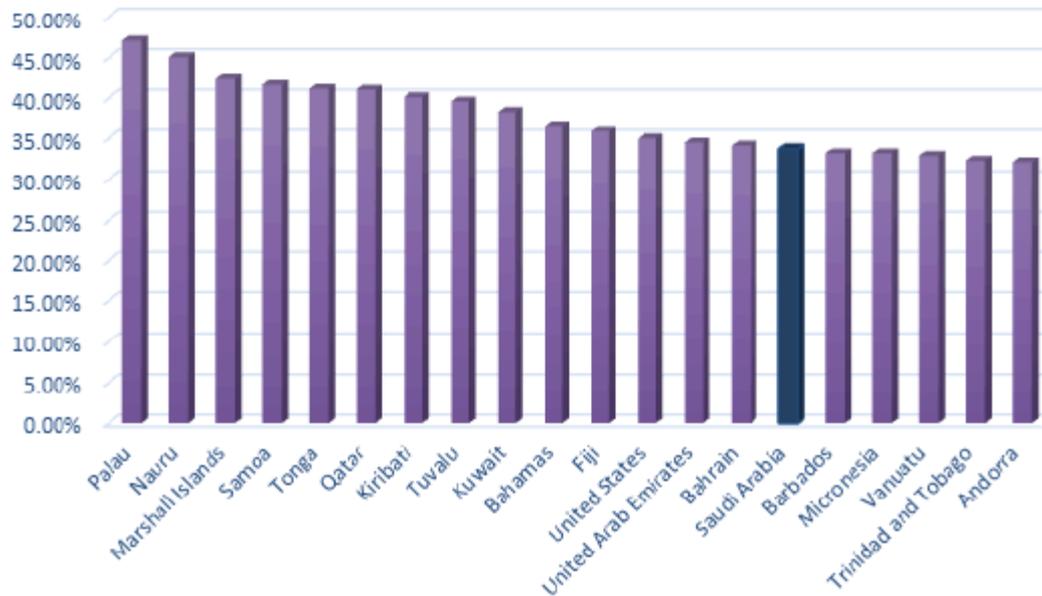
Figure 1: World Obesity Rates. The figure shows that Saudi Arabia is the world 15th most obese country, with an overall obesity rate of 33.7%

The prevalence of obesity, over the past 3 decades, has increased in many countries around the world. It is defined by a 30 or higher body mass index (BMI). The problem of obesity extends globally as estimated by the WHO. In 2008, worldwide 1.5 billion adults were overweight, where nearly 300 million women and over 200 million men were obese. However, across different nations, the prevalence of obesity varies, ranging from below 5% in Japan, China, Indonesia, India, and certain African countries to over 75% in Nauru and Samoa. In addition, childhood obesity is also on the rise globally, and an epidemic in some countries. Worldwide, 22 million children approximately, under age 5, are estimated to be overweight. Obesity prevalence has also increased dramatically among children aged 6-17 years, which is extending into the developing world from the developed nations. The rising trend, as indicated by international data, is not confined to the developed world, and it is predicted that by 2030, a majority of adult population of the world would be either obese or overweight (Imedpub, 2016).

In the rise of obesity and overweight, the interaction of a number of factors is contributing, which include metabolic, genetic, environmental, and behavioral influences. According to Mahmoud and Arulkumaran, the rapid growth in the rate of obesity is directly contributed by environmental and behavioral factors, rather than the biological factors. Moreover, racial or ethnic differences, consumption pattern, and lifestyle also influence the rate of obesity. For instance, as compared to rural areas, people in urban areas have higher obesity rate, possibly due to consumption of high-fat diets and more sedentary lifestyles. For daily living, the amount of energy spent has also reduced over the years, which also promotes obesity. Obesity is also often associated with high socio-economic status; as populations in the developed world are mostly affected by obesity (Imedpub, 2016).

Obesity in Saudi Arabia

Over the past 3 decades, the prevalence of overweight and obesity has increased dramatically worldwide. The rising trend of obesity indicates that this increase is not only confined to the developed world, but also extending towards the developing world. In the context, Saudi Arabia is now among the nations with the highest obesity and overweight prevalence rates due to a number of factors.

Over the past few decades, Saudi Arabia has become increasingly westernized, and now it has one of the highest obesity and overweight prevalence rates. Obesity in the county is a major cause of concern, where 7 out of 10 people are experiencing the problem. Previous studies related to prevalence of obesity in the Kingdom of Saudi Arabia (KSA) indicate an increasing trend in obesity and overweight, which are major sources of a number of other diseases, including hypertension, diabetes, obstructive sleep apnea, hyperlipidemia, and osteoarthritis (Imedpub, 2016).[9]

The rapid change in diet, lack of physical activity and lifestyle has led to an increase in the number of obese and overweight people in Saudi Arabia. Statistics from the World Health Organization show that the prevalence of obesity in the GCC is among the highest in the world. Obesity in the Kingdom of Saudi Arabia 28.7%, and the proportion of overweight 30.7% in the age group of 15 and above men and women, according to the results of the National Health Information Survey in 2013. Obesity is 9.3% among school-age children and 6% among preschool-age children, due to the high rate of obesity in Saudi Arabia and its association with many non-communicable diseases such as diabetes, heart disease, stress, arthritis Cancer, and other diseases, programs had been developed by the Ministry of Health to combat obesity (MOH Saudi Arabia, 2013).
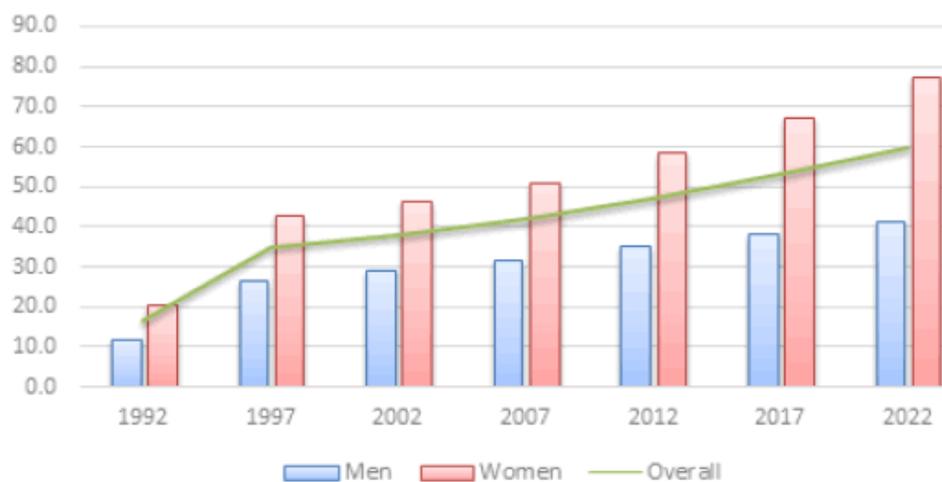
Figure 2: Obesity Prevalence % (1992-2022). As indicated earlier, the current research paper adopts a qualitative approach and follows a review-design to explore the research problem; i.e. to examine the prevalence of obesity in KSA, and explain its causes and consequences, the study performed a detailed literature review. The following table represents a summary of the reviewed studies in order to highlight and discuss the key statistics and findings

Methodology

Study area:

The study was conducted in the faculty of public health and health informatics, Umm Al-Qura University in Makkah city.

Study population:

All of public health students in the college.

Study design:

Cross-sectional study design used to evaluate the knowledge, perception, behavior and practice among students of public health towards obesity.

Sample size:

Sample size determined by selecting 50% of public health students at faculty of public health using stratified sampling technique in which 136 students participated in the study.

Inclusion criteria:

All students of public health at Umm Al-Qura University, Makkah city.

Exclusion criteria:

All females and internship students excluded.

Data collection and interpretation:

The data has been collected through questionnaire and interpreted using SPSS program.

Ethical issues:

Ethical clearance was obtained from the ethical committee of faculty of public health.

Results

Table.1. Number of respondents according to department& educational level

student department * education level Cross tabulation					
Count					
		education level			Total
		second level	3rd level	4th level	
student department	Health Promotion Department	10	11	11	32
	Environmental Health Department	10	9	9	28
	Epidemiology Department	11	13	15	39
	Health Informatics Department	9	15	13	37
Total		40	48	48	136

Stratified sampling technique used to select students from four departments
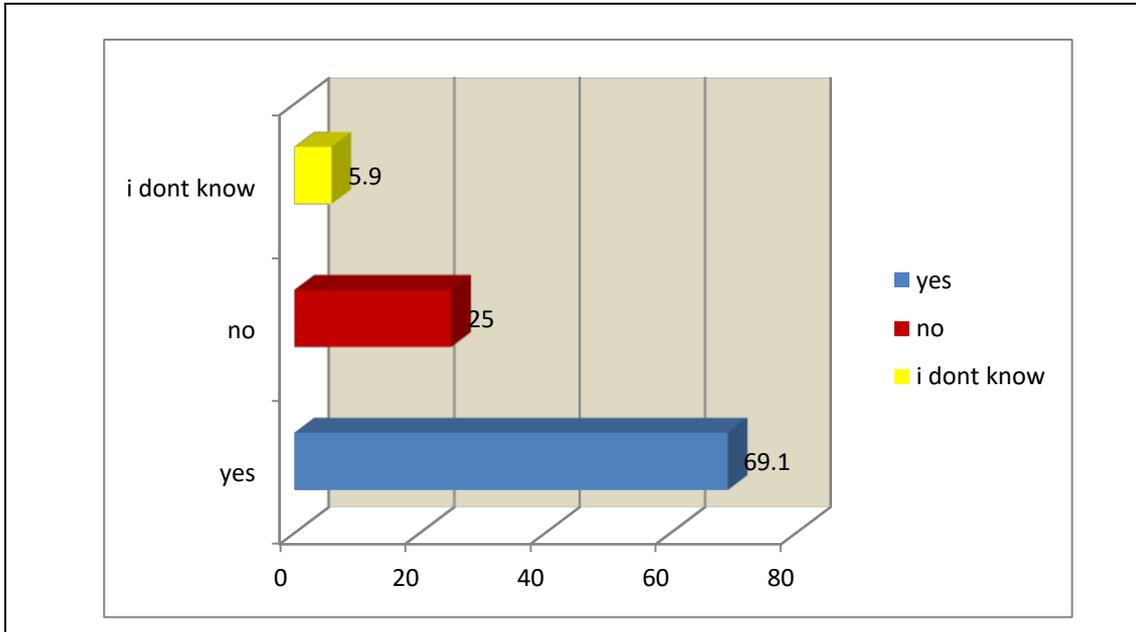
Figure 3: Perception of students on BMI, relation with obesity

69.1 of students knows what the mean of BMI, while 30.9 don't know.
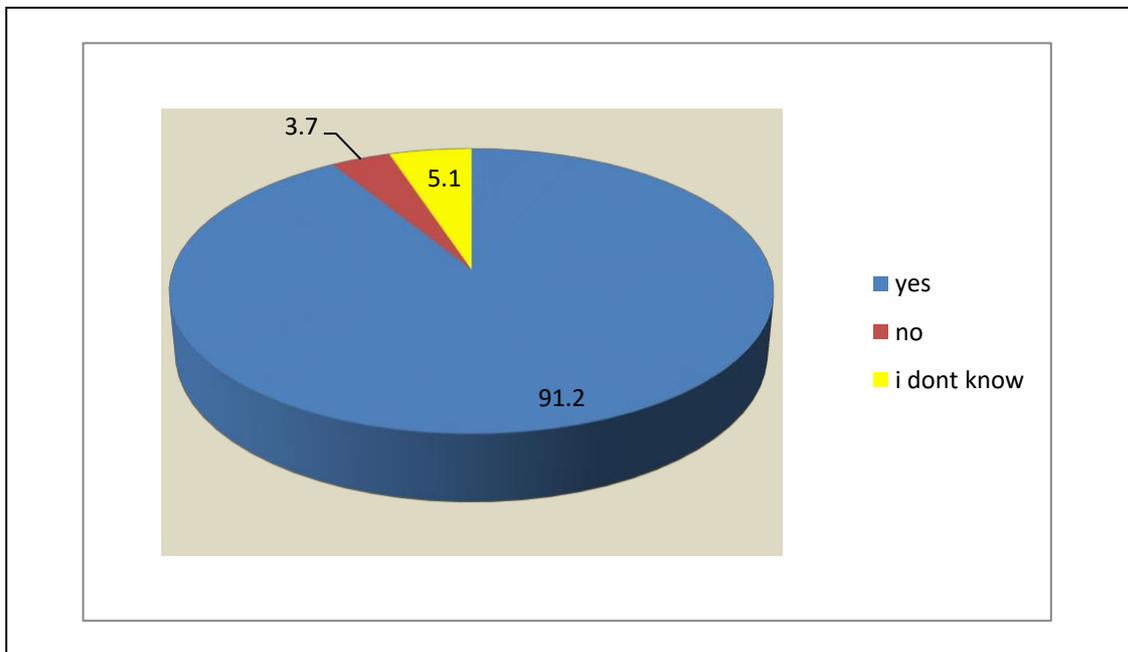
Figure 4: Knowledge of students on relations between obesity and diabetes Mellitus type 2

Majority of students (91.2%) knows relationship between obesity and diabetes type 2.
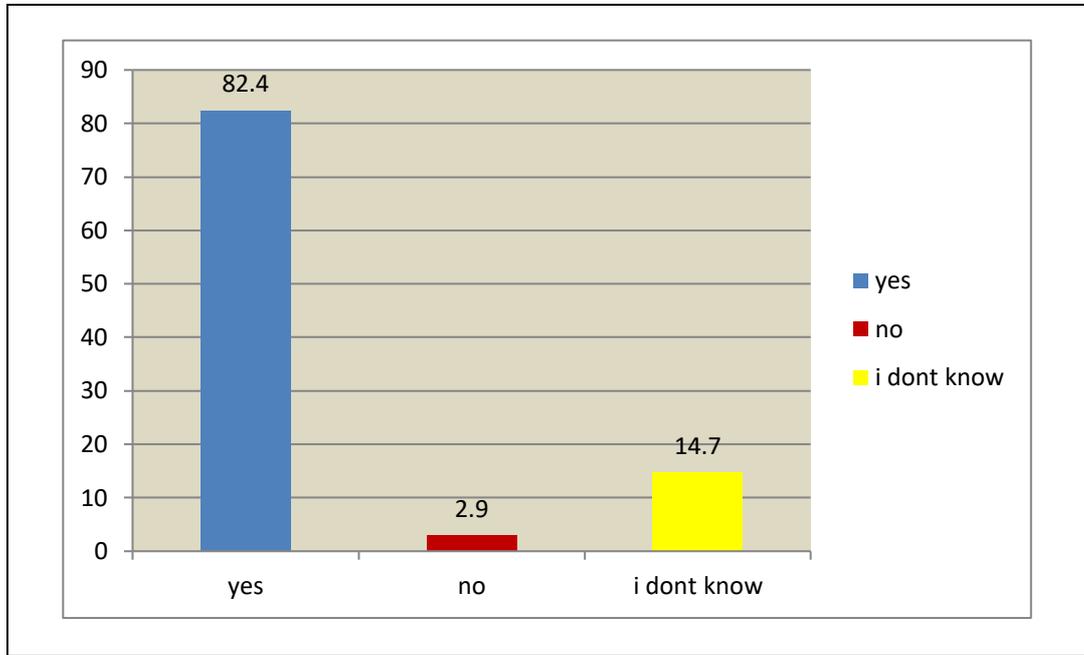
Figure 5: Students understanding on obesity-hypertension relationship

Majority of students understands obesity-hypertension relationships.
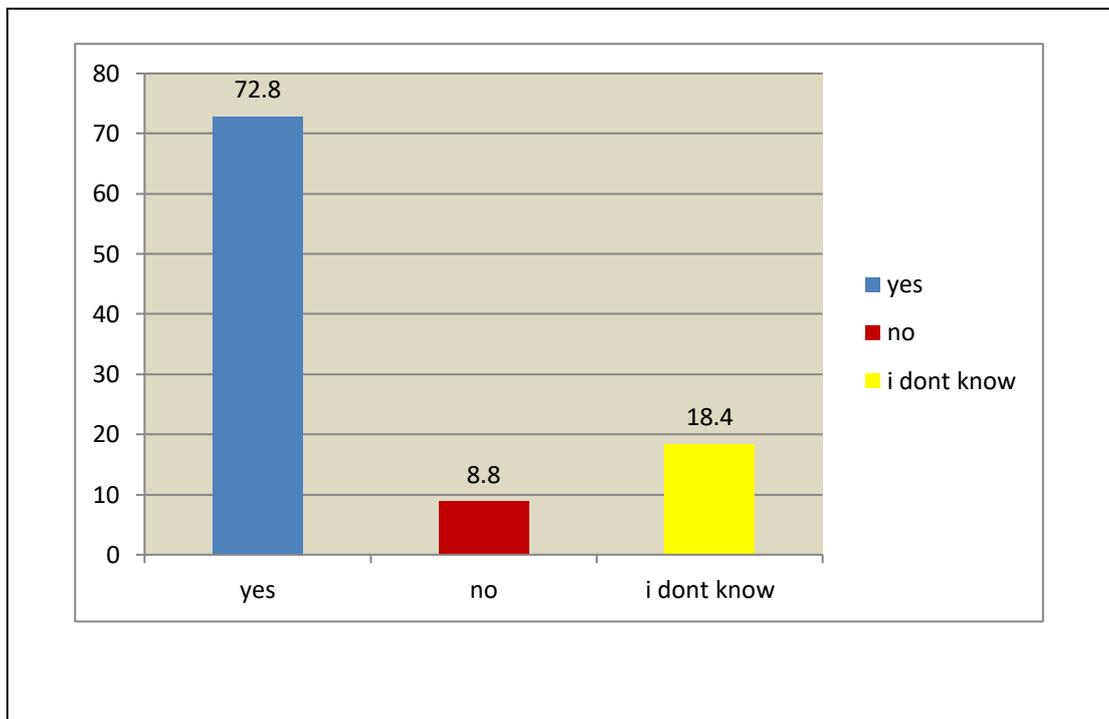
Figure 6: Knowledge of students on obesity- sleep apnea relationship

Most of students (72.8) are aware that obesity is a risk factor for sleep apnea.
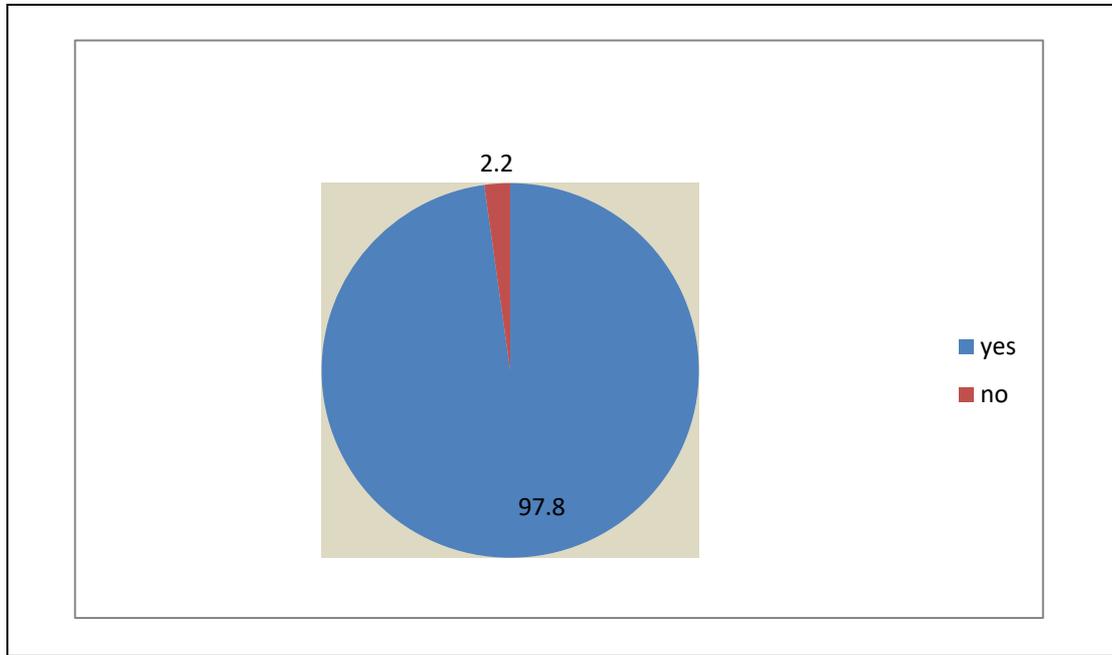
Figure 7: Physical activity and weight control

Showing perception of students on physical activity and weight control relations.
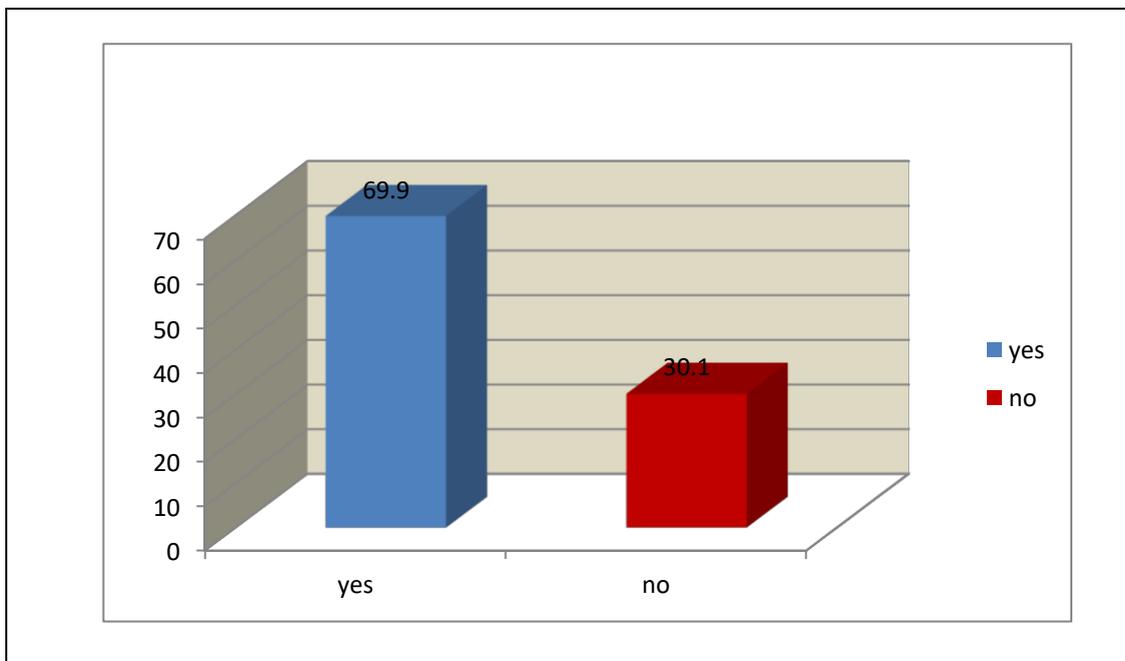
Figure 8: Student's practice of physical activity

(69.9%) of students practicing physical activity.
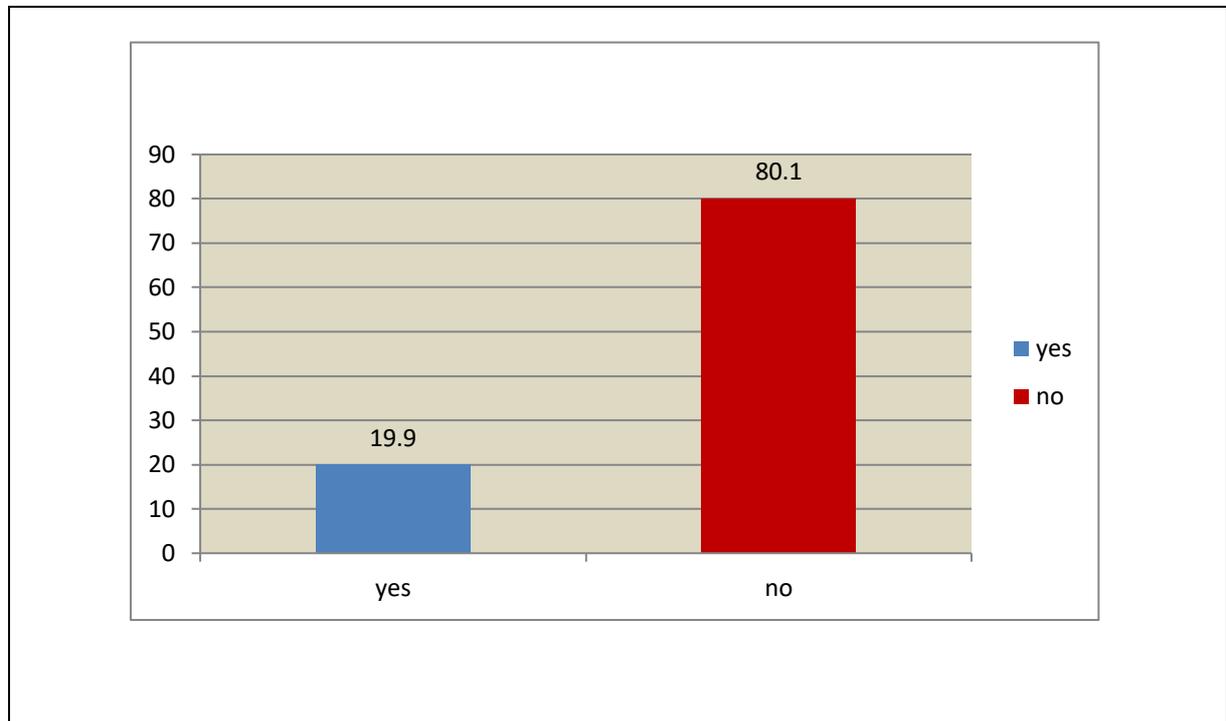
Figure 9: Knowledge of students on the importance of monitoring daily calories

The majority of students (80.1) do not monitor their daily calories.
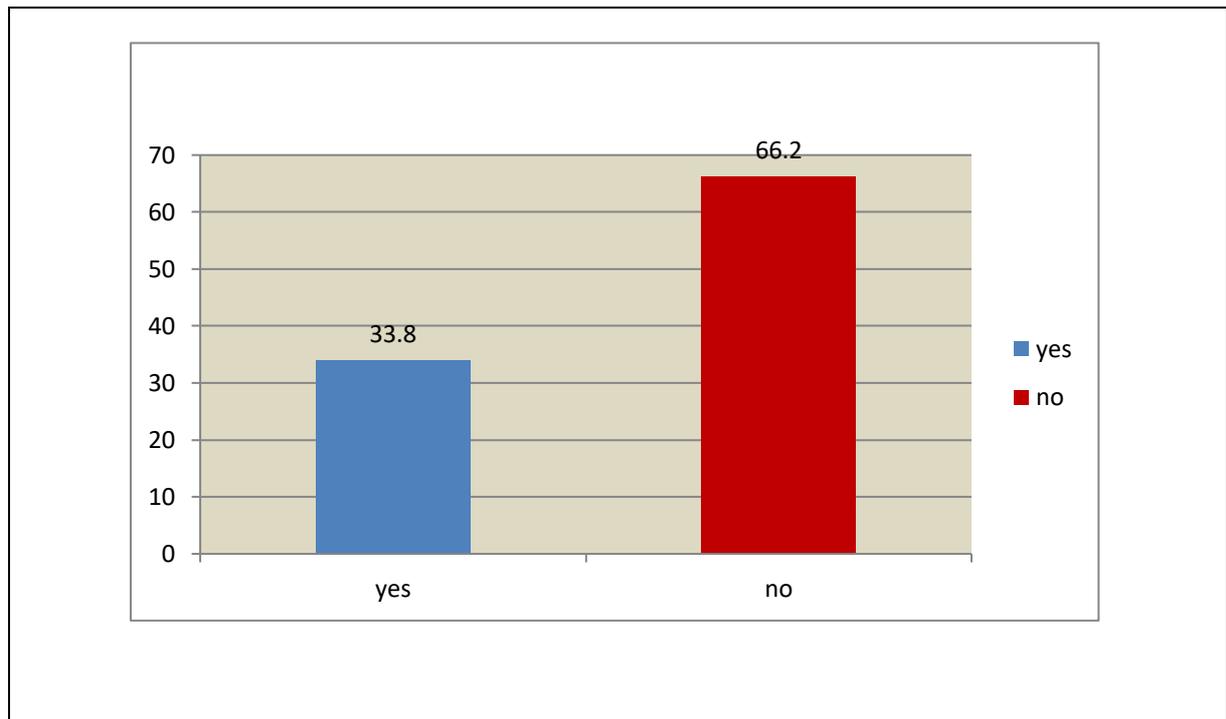

Figure 10: Monitoring of blood glucose among overweight or obese students

(66.2) of those students do not monitor their blood glucose, while (33.8) do.
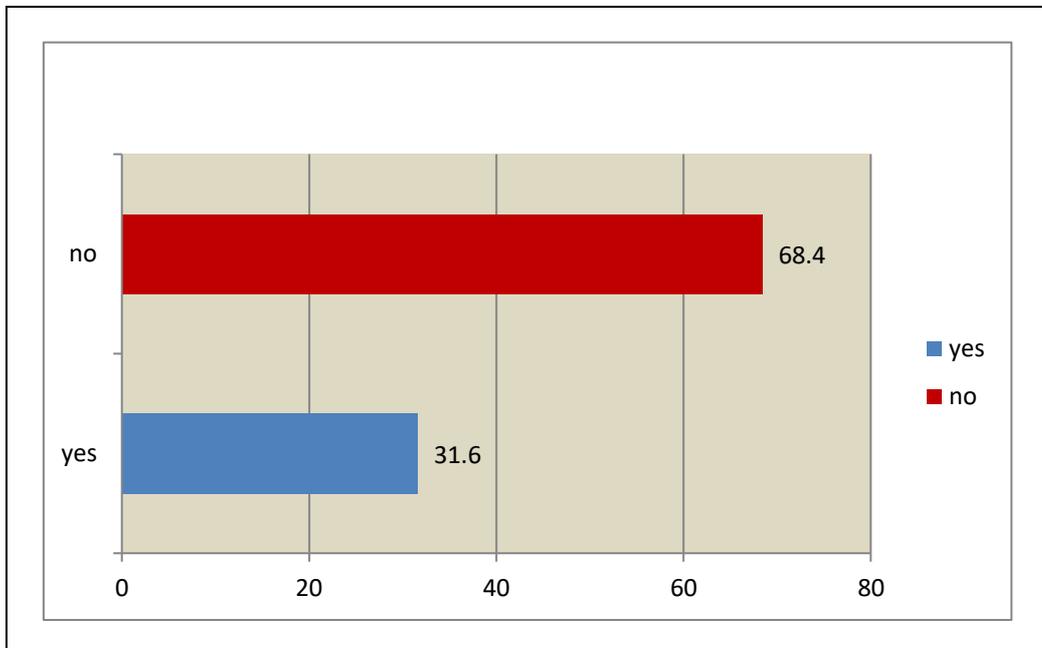
Figure 11: Monitoring of blood pressure levels among overweight or obese students

Large numbers of overweight or obese students (68.4) do not monitor their blood pressure.
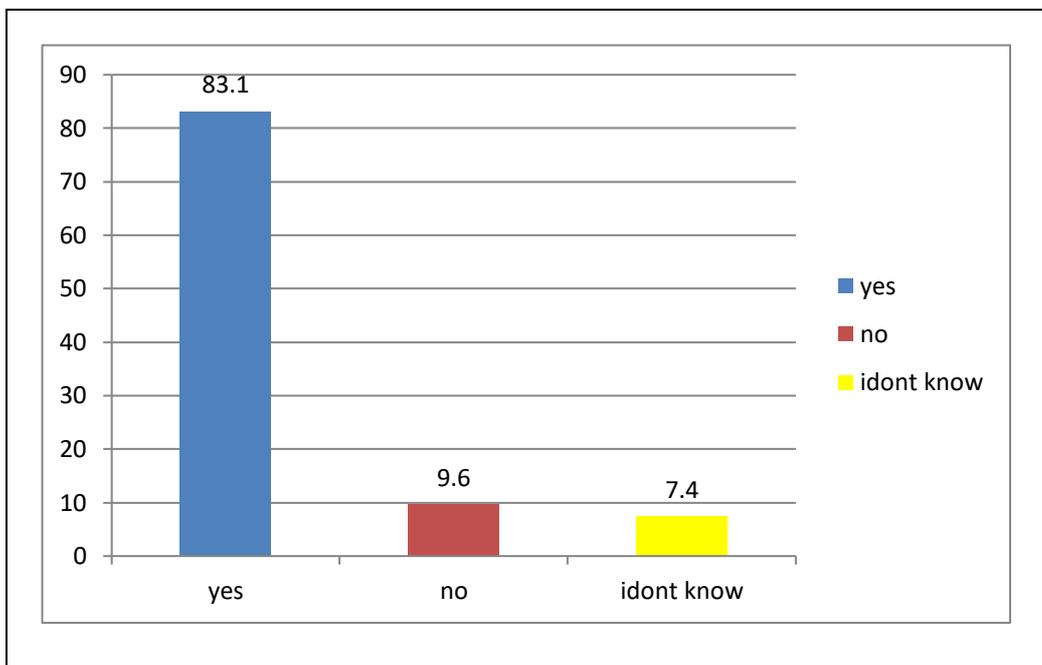

Figure 12: Public health students should be models and maintain normal weight

Showing attitudes of Public health students towards being with normal body weight.
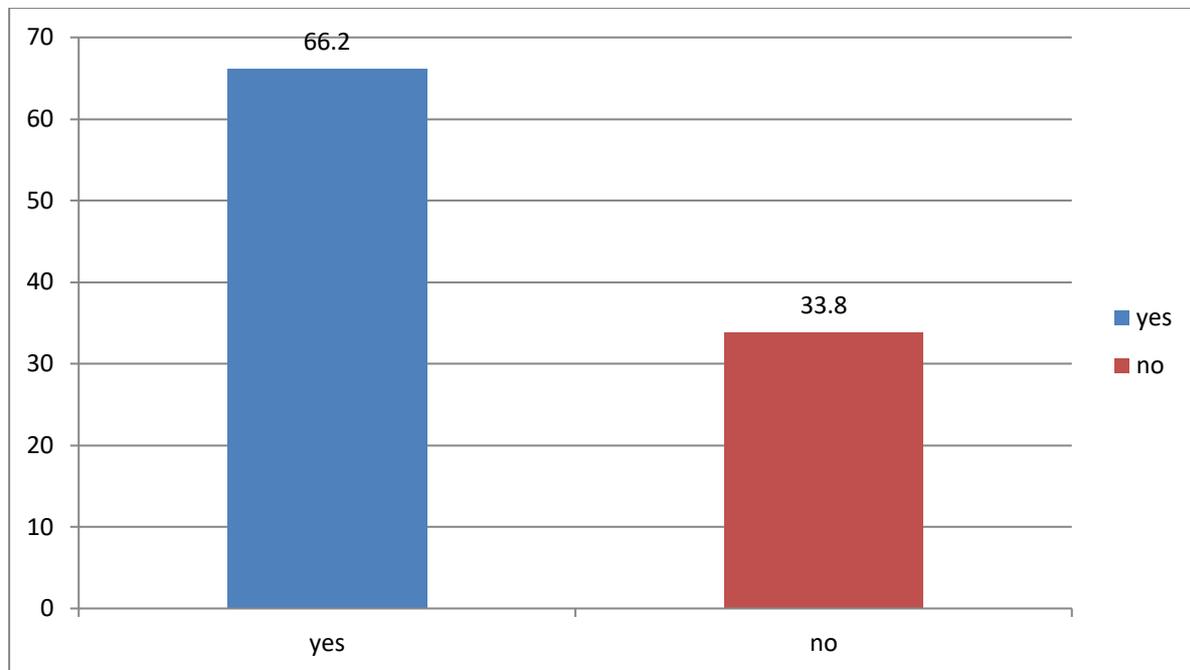
Figure 13: Knowledge of students about health education material on obesity

Two-thirds (66.2%) of students has come across health education material.

Discussion

The cross-sectional study was designed to assess knowledge, perception, behavior, and practice among students of public health in Umm Al-Qura University towards obesity and overweight. Obesity and overweight remains one of the major risk factors for many non-communicable diseases, where students of public health considered as a part of the major components in the fight against obesity and overweight. Body mass index (BMI) is recommended by the WHO to classify obesity and is used as a tool to identify patients or individuals at risk for adverse health outcomes. Referring to perception of public health students on BMI, (69.9%) of students understand BMI-obesity relationship, while (30.9) didn't know, this result agrees with the study of Lakshmi Sivashunmugam, Reshma M Ansari, which identified gaps in the knowledge and poor perception among medical students (Ansari, 2017).

The study shows that majority of students (91.2%) knows the relationship between obesity-diabetes mellitus, obesity-hypertension (82.4%), in addition to that most of students (72.8%) aware of obesity-sleep apnea relationship. The perception of students on weight control through physical activity is positive, where (97.8%) understand this relation. Referring to public health students practice, approximately (70%) have a physical activity, while (30%) are not practicing any type of these activities although they understand the importance of it in the prevention of obesity, this agrees with the study of Martins, Catia, Norsett-Carr, anette which revealed that medical students trust their acquired knowledge, but feel pressured by time constraints and the complexity of lifestyle issues and experience barriers to long-term follow-up (Martins, et al., 2017).

According to attitudes of students, it has been clarified that most of students (83.3%) thought that public health students should become models and maintain normal weight. It has been clarified that two-thirds of overweight or obese students are not monitoring their blood glucose and blood pressure, this situation will become a risk factor for these diseases in the nearest future, and approximately similar percentage of them mentioned they had come across health education materials on obesity.

Conclusion

The study concluded that there was a weakness in the perception and knowledge of students on the understanding of BMI, practicing of physical activities, monitoring blood glucose and pressure for obese and overweight students, study recommends for more concentration in academic and non-curricula activities to change these perceptions and practices. The study concluded that the knowledge of students on major risk factors of obesity, relations of obesity with diabetes mellitus type 2, hypertension, sleep apnea, relation of physical activity and weight control were acceptable. According to the study there were a problem in monitoring blood glucose and hypertension among overweight and obese students, which may be reflected in other health problems in the future.

Recommendations

1. Introduce extra educational and non-curricular programs on lifestyle, nutrition and obesity for public health students.
2. Establishment of regular physical activities programs for students especially for those who are overweight or obese.
3. Strengthening of health education programs on obesity and other associated health problems inside and outside university campus.
4. The supply of weight machines in faculty departments.
5. Training of public health students on blood glucose, hypertension measurements methods and equipment's.
6. More researches are required for evaluating knowledge, perception, behavior and practice among public health and other students towards obesity.

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Exercise Modulation of Blood Pressure, Respiratory Rate and Pulse Rate in Undergraduate Students

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Abstract
Background: Physical Activity improves the functional capacity of the circulatory system with minimum myocardium stress. Objectives: This study was designed to assess exercise modulation and sex difference of blood pressure (BP), respiratory rate (RR) and pulse rate (PR) of selected undergraduate students. Design: This study involved 360 students selected using convenience sampling method, aged between 18 and 35 years. Lecturers and postgraduate students were exempted from the study. BP was measured using Sphygmomanometer before exercise and 30 minutes interval during exercise for two hours. Bicycle Ergometer was used as the exercise apparatus. Stop watch was used to measure PR and RR. Data were analyzed using descriptive statistics. Results: In total, 360 subjects, 180 males and 180 females, were included in the study. The mean SBP at baseline was 111.59 mmHg±0.35. It reduced to 96.99 mmHg±0.36 after 120 minutes of exercise (p=0.000). The mean DBP at baseline was 69.78mmHg±0.32. It reduced to 56.01mmHg±0.30 after 120 minutes of exercise (p=0.000). The mean Respiratory Rate (RR) at baseline was 15.91 cycles/ minute±0.11. It increased to 28.82 cycles/minute±0.21 after 120 minutes of exercise (p=0.000). The mean Rate Pulse Pressure (RPP) at baseline was 8322.35 mmHg. cycles/ minute±0.05 It increased to 12033.55mmHg.cycles/minute±0.21 after 120 minutes of exercise (p=0.000). Moreover, the male-female relationships showed that the SBP, DBP, RR and RPP were significantly lower in female than male subjects (p=0.000). Conclusions: Exercise reduces SBP and DBP. This reduction is greater among females.

Keywords: Sphygmomanometer, Blood Pressure Measurement, Pulse Rate, Respiratory Rate, Exercise.

Introduction

Physical activity (PA) is defined as any bodily movement produced by skeletal muscles that requires energy expenditure (WHO, 2019), provokes changes in the cardiovascular function of body with a positive effect on both the prevention of life-threatening CVD (WHO, 2019, Jakovljevic, 2018). Furthermore, PA has been linked to a reduced risk of several diseases, such as obesity, diabetes and metabolic syndrome. Nonetheless, it is not clear how much PA is required to reduce the risk of these diseases. A plethora of studies suggests that the increased level of PA significantly improves the functional capacity of the circulatory system by increasing stroke volume, cardiac output and enhancing blood and oxygen supply to active tissues (performance), with a minimum myocardium stress (economy) (Fletcher et al, 1996, ACSM, 2014).

The term "myocardial economy" describes the ability of the heart to meet the needs of the working tissues for blood and oxygen supply with the minimum of myocardium stress (Astrand et al, 2003, Leon et al, 1981). Heart rate (HR) and systolic blood pressure (SBP), are important prognostic factors of cardiovascular health; their lower rates are related to improved physical fitness (Shalnova et al, 1996, Cheng et al, 2003, Palatini et al, 2007) and decreased cardiovascular morbidity and mortality (Palatini et al, 2007, Perret-Guillaume et al, 2009, Kjeldsen et al,2001). The rate-pressure product (RPP = HR × SBP) is strongly and positively related to coronary blood flow and myocardial oxygen uptake (Astrand et al, 2003, Gobel etal, 1978, Czernin et al, 19956)· All of the above are positively related to myocardial oxygen demands and hence myocardial workload, being important non-invasive and inverse indicators of myocardial economy (Astrand et al, 2003, Fletcher et al,20016)·

There is limited data regarding the impact of PA on the myocardial function in students. Particularly, the effect of PA on the very important parameters of myocardial economy, such as HR, SBP, DBP< RR and RPP in students need to be further clarified. The purpose of this study was to investigate the effects of PA on myocardial economy in undergraduate students.

Method

A total of 360 students were randomly selected from the students' population of Olabisi Onabanjo University, Sagamu campus. At the baseline evaluation, health status was assessed. Students who are healthy and aged 18 to 35 years, with normal body weight (18.5<BMI<25 kg/m2) were eligible for the study. Our exclusion criteria were the following; metabolic diseases (such as diabetes mellitus or thyroid disease), physical disabilities, heart disorders, recent illness, and cardiac medications,

Before the day of their appointment, all participants were well informed about the research procedures and became familiar with the BP measurements and the test equipment (bicycle ergometer).

Measurements were conducted during morning hours, under the same conditions of temperature and humidity; all subjects abstained from coffee and alcohol, for at least 4 hours before the exercise procedure. Bicycle Ergometer was used for the exercise procedure. Stop watch was used to measure RR and PR.

Ethical Approval and Informed Consent

Ethical clearance for the study was obtained from the Health Research Ethics Committee (HREC) of Olabisi Onabanjo University Teaching Hospital (OOUTH), Sagamu (No HREC/OOU/0080). All participants (360) of this study signed an informed consent form, in accordance to the committee regulations, before completing a questionnaire and taking their anthropometric measurements. The use of proforma was adopted.

Data analysis

Data was expressed as means with ± standard deviation (SD). The normality of distribution for age, SBP, HR and RR was assessed with the Kolmogorov–Smirnov test. Multivariate analysis of variance (general linear model, full factorial – type III) – MANCOVA – was used to detect differences in HR, BP and RPP between parameters of PA. All HR, BP and RR values were considered as dependent variables. The level of significance was set as a p-value <0.05 throughout. Statistical analysis of the data was performed using the IBM SPSS version 19 software package (2010 SPSS Inc., Chicago, IL, USA).

Results

In total, 360 subjects, 180 males and 180 females, with the age group of 20 to 24 years constituted the highest age group were included in the study. All variables were normally distributed (table 1).

The mean SBP at baseline was 111.59mmHg±0.35. It reduced to 96.99mmHg±0.36 after 120 minutes of exercise.

The mean DBP at baseline was 69.78mmHg±0.32. It reduced to 56.01mmHg±0.30 after 120 minutes of exercise The mean Respiratory Rate (RR) at baseline was 15.91 cycles/ minute±0.11. It increased significantly to 28.82 cycles/minute±0.21 after 120 minutes of exercise. The mean Pulse Rate (PR) at baseline was 74.58 beat/minute±0.15. It increased to 124.07 beat/minute±0.90 after 120 minutes of exercise. RPP increased from 8322.35cycle mmHg/minute±0.25 at baseline to 12033.55±0.63 cycle mmHg±/minute after 120 minutes of exercise (p=0.000) (table 2).

In male, the mean SBP at baseline was 111.75mmHg±0.44. It reduced to 99.12mmHg±0.43 after 120 minutes of exercise. The mean DBP at baseline was 70.50mmHg±0.40. It reduced to 56.07mmHg±0.38 after 120 minutes of exercise.

The mean Respiratory Rate (RR) at baseline was 15.74 cycles/ minute±0.15. It increased to 28.96 cycles/minute±0.30 after 120 minutes of exercise. The mean Pulse Rate (PR) at baseline was 74.50 beats/minute±0.21. It increased to 127.43 beats/minute±1.29 after 120 minutes of exercise (p=0.000) (table 3).
In female subjects, the mean SBP at baseline was 111.42mmHg±0.56. It reduced to 91.85mmHg±0.58 after 120 minutes of exercise. The mean DBP at baseline was 69.06mmHg±0.50. It reduced to 55.95mmHg±0.44 after 120 minutes of exercise

The mean Respiratory Rate (RR) at baseline was 16.07 cycles/ minute±0.11. It increased to 28.68cycle/minute±0.31 after 120 minutes of exercise. The mean Pulse Rate (PP) at baseline was 74.66beats/minute±0.21. It increased to 120.71 beats/minute±1.20 after 120 minutes of exercise (p=0.000) (table 3).

In male the mean Rate Pressure Product (RPP) at baseline was 8325.38mmHg beats/ minute±0.09. It increased to 11738.85mmHg beats/minute±0.31 after 120 minutes of exercise. In female the mean Rate Pressure Product (RPP) at baseline was 8318.62mmHg.cycle/minute±0.12. It increased to 11087.21mmHg beats/minute±0.70 after 120 minutes of exercise (p=0.000) (table 3).

Finally, the male female relationships of both sexes were demonstrated in table 5. The SBP, DBP, RR, PR and RPP were significantly lower in female than male subjects (p=0.000)

Table1: Showing Age and Gender characteristics of the Participants.

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	180	50.0
	Female	180	50.0
Age	<20 years	113	31.4
	20-24 years	165	45.8
	25-29 years	73	20.3
	≥ 30 years	9	2.5

Table 2: Variability of vital parameters of all the subjects during study period

Variable	Baseline	30 mins	60 mins	90 mins	120 mins	P
SBP	111.59±0.35	108.04±0.45	104.53±0.41	99.31±0.39	96.99±0.36	0.000*
DBP	69.78±0.32	62.36±0.33	59.59±0.31	57.80±0.30	56.01±0.30	0.000*
RR	15.91±0.11	19.26±0.12	23.43±0.17	26.48±0.20	28.82±0.21	0.000*
Pulse	74.58±0.15	90.45±0.53	105.15±0.76	115.66±0.84	124.07±0.90	0.000*
RPP	8322.35+0.25	9772.22+0.49	10991.33+0.59	11486.20+0.62	12033.55+0.63	0.000*

Table 3: Variability of vital parameters of female and male subjects during study period

Variable	Baseline	30 mins	60 mins	90 mins	120 mins	P
SBP M	111.75±0.44	108.38±0.63	104.69±0.49	99.45±0.46	92.12±0.43	0.000*
F	111.42±0.56	107.69±0.63	104.38±0.66	99.16±0.63	91.85±0.58	0.000*
DBP M	70.50±0.40	62.59±0.46	59.65±0.40	57.86±0.39	56.07±0.38	0.000*
F	69.06±0.50	62.12±0.46	59.52±0.47	57.73±0.45	55.95±0.44	0.000*
RR M	15.74±0.15	19.35±0.17	23.55±0.24	26.61±0.27	28.96±0.30	0.000*
F	16.07±0.16	19.17±0.16	23.31±0.25	26.34±0.28	28.68±0.31	0.000*
Pulse M	74.50±0.21	90.20±0.76	107.99±1.09	118.79±1.20	127.43±1.29	0.000*
F	74.66±0.21	90.71±0.73	102.30±1.02	112.53±1.12	120.71±1.20	0.000*
RPP M	8325.38+0.09	9775.88+0.48	11305.47+0.53	11813.67+0.59	11738.85+0.55	0.000*
F	8318.62+0.12	9768.56+0.46	10678.07+0.67	11158'47+0.71	11087.21+0.70	0.000*

Discussion

We set out to evaluate whether PA is an effective physiological stimulus to improve myocardial function in healthy students. The results of the present study indicated that increased PA, from low to moderate level, significantly lowered DBP and SBP in both sexes. The RR and PR were found to increase in subjects with higher levels of PA, this association was however significant.

Physical activity and heart rate

The PA-related low resting HR has been found to decrease the incidence of CVD and to be positively related to cardiovascular and all-cause mortality (Saxena et al, 2013, Mok et al, 2019). However, the effects of PA on HR in students have not been thoroughly studied yet. Similar to our findings were observed in sportive students, where increases in PA intensity were associated with higher HR variability (Buchheit et al,2004). Recent data has also indicated that moderate PA was associated with superior cardio-vagal baroreflex sensitivity reflecting the efficiency in regulating HR in older adults (O'Brien et al,2019). These results suggest that increased PA may be sufficient to affect the autonomic tone of adults, similar to exercise modalities that have been shown to do so (Karavirta et al, 2009, Ueno and Moritani, 2003). However, in contrast to our results, others have reported that in older adults, no statistically significant correlation was identified between resting HR and leisure-time PA (O'Hartaigh et al, 2014, Miranda et al, 2014).

Our findings indicated that the beneficial effect of PA on HR was stronger and significant for male compared to female. These results are in line with the study by Carter et al (Carter et al, 2015) who reported that men have lower HRs than women when performing exercise of similar intensity. Moreover, Rennie et al (Rennie et al, 2003) have found that increased level of moderate PA had significantly lowered resting HR in men, but not in women. However, these assessments were not conducted in older people. The PA-induced lower resting HR, as it was found in our male participants, may be related to increased stoke volume observed in exercising or physically active individuals (Rennie et al, 2003, Higginbotham et al, 1986, Chou et al 2019). Yet, it remains unclear why the above haemodynamic mechanism may hold true and explain the PA related HR decline in male, but not in female. The latter may be attributed to the sex-based differences in exercise-related tests such as VO2 norms, BP and lung diffusion capacity (Parker et al, 2010). It seems that when placed under increased cardiovascular demands, men respond by increasing vascular resistance, and consequently BP, whereas female respond by increasing HR, therefore presenting higher HRs following PA or exercise (Huxley, 2007).

Increased PA may provoke the physiological mechanisms that affect parasympathetic tone in healthy adults. Lower HR is, at least partially, the result of increased parasympathetic tone and may be related to the improvements in sympathetic control of vasomotor tone provoked by PA (Shin et al, 1997, Yataco et al, 1997). However, others have supported that the parasympathetic tone may be increased by high-intensity activity, such as jogging, while moderate activity is not (Schuit et al, 1999). Further studies are required to determine whether PA of vigorous-intensity would be more effective towards lowering HR in older adults of both sexes, compared with existing levels of PA in this population.

Physical activity and blood pressure

Blood pressure is directly proportional to the effect of cardiac output on the total peripheral vascular resistance and depends on the total blood volume and viscosity (Gori et al, 2015). PA has been associated with the prevention of increased BP, suggesting a mechanism which hypertensive patients can benefit. The results of the present study confirmed the benefits of PA in lowering BP in students, reported in a limited number of similar purpose studies. We found that BP was independently associated with increased PA, indicating that a dose-response relationship may exist between levels of PA and SBP; participants with a moderate PA profile had lower SBP compared with those with low PA. Similar findings were reported in the study by Hagberg et al. 1989 who reported that in 60-69 year old men and women SBP was marked lower after moderate exercise training (Hagberg et al, 1989). Physiological mechanisms such as systemic adaptation of the arterial wall, reduction of pro-oxidant levels and arterial stiffness, increases in central nitric oxide synthase activity and improvement in endothelial function may explain the effects of increased PA levels on BP, as it was found in our study.

Furthermore, we found that sex was significantly related to the SBP, indicating that routinely performed, increased PA was associated with lower SBP in females but not in male. This finding has also been supported by Reaven et al (Reaven et al, 1991) who indicated that in women, lower SBP and DBP were measured with low intensity, leisure-time PA, while further reductions were present with heavier PA. One possible explanation for the PA-induced lower SBP level in female may reside on the stimulation of their autonomic control. More specifically, sex-based differences in autonomic control of BP may underlie some of the differences observed in our study. We found that increased PA, from low to moderate level, seems to be adequate to affect autonomic control and provoke lower SBP levels in female, but not in male participants. Even more, although the relative contributions of potential mediators regarding MET energy cost and total workload of PA were qualitatively similar between sexes in this study, the beneficial effect of PA in BP was stronger for females compared to males. It has been supported that in male a higher level of PA, such as vigorous exercise, is required to affect autonomic control and provoke changes in BP (Cappio-Rivera et al, 2016). However, the tools used in the present study do not allow further speculation. On the other hand, previous studies have indicated that both sexes present equivocal results on BP levels following aerobic exercise (Cornelissen et al, 2010, Moreira etal, 2014).

Physical activity and pulse-pressure and respiratory rate and Rate Pressure Product

Rate-pressure pressure is a valuable marker of cardiac function and an important index of myocardial economy (Astrand et al, 2003). To the best of our knowledge, the present study may be the first to examine the PA effects on RR in students. However, despite the fact that increased PA lowered SBP (in female) and HR (in male), as it was indicated by our findings, however statistical significance was observed in the increase of RR of both sexes. This may attributed to the fact that increased PA, from lower to moderate level, either didn't provoke any significant myocardial hemodynamic effects or didn't affect baroreflex control of blood vessels (Halliwill et al, 1996). In line with our results, Forjaz et al, 1998 found that in young normotensives exercise of moderate intensity lowered HR, however did not reduce RR.

It is well known that exercise intensity influences BP and HR responses. Therefore, it is possible that either exercise of higher intensity or vigorous PA may also have distinct effects on RR and PR, compared to leisure-time PA. Elsewhere, it has been reported that there is a dose-response relationship between PA intensity and cardiovascular benefits; high-intensity PA tends to lead to greater cardiovascular functional gains than low-intensity. (Alansare et al, 2018). This is further supported by Rennie et al, 2003 who suggested that parasympathetic tone may be increased by vigorous PA, compared to moderate PA, thus representing a possible mechanism by which PA reduces heart disease risk. It should be pointed out, though, that it is often not efficient to incorporate older adults in high intensity activities. Thus, vigorous activities are usually not advisable for sedentary older population (McPhee et al, 2016).

Besides intensity, total weekly energy expenditure during PA may be a crucial factor defining the dose-response relation between PA and RR and PR. The World Health Organization (WHO) suggests that older adults should perform at least 150 min of moderate-intensity PA per week (42), thus 600 MET.min.wk^{-1} (Shin et al, 1997). Therefore, although the WHO's PA weekly expenditure criteria should be recommended for people.

Strengths and Limitations

Among the strengths of the present study were the random selection of the subjects from a well-defined and homogeneous target population, the high participation rate and the double-blind design (neither the students, nor the examiner were aware of subjects' PA status). In addition, the control for any potential confounders and limiting factors, such as age, health status, BMI added statistical power to our results.

On the other hand, there are certain limitations that have to be mentioned. Due to the strict selection criteria, the size of the sample was limited. A larger number of subjects would have made the application of statistical findings more appropriate. It should be noted that we were not able to fully control for other confounding factors, such as coffee consumption, alcohol and eating habits. Finally, generalization of our results from a sample of healthy community of students would be ill-advised. Socioeconomic status, dietary habits and PA profile, as well as other factors, might differ between our participants and the general students population. In any case, longitudinal research is required to determine whether PA of longer duration and/or higher intensity may have even more strenuous results and significantly lower RR and PR thus improving myocardial function and enhance the prevention of cardiovascular diseases in healthy students.

Conclusion

In the present study, increased PA, from low to moderate level, was related to significantly lower HR in male and SBP in female. The RPP was found lower in healthy subjects with higher levels of PA, but this association was not significant. Further investigation is needed to determine the precise dose-response relationship between PA and RR and PR. Future research must be carried out to clarify how PA of longer duration and/or higher intensity may affect myocardial functions and cardiovascular responses in healthy individuals.

Conflicts of Interest
None of the authors had any conflict of interest in relation to this study.

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