

Physical Activity Status and Readiness for Exercise Participation Among Lebanese Adults: A Pilot Study

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Abstract— Background: Despite the well-documented health benefits of physical activity, physical inactivity remains a global pandemic, and constitutes one of the leading risk factors for major non-communicable diseases.

Objectives: The primary objective was to evaluate the current physical activity status of Lebanese adults, as well as their readiness to participate in an exercise program. A secondary aim was to measure the physical inactivity prevalence among adults.

Methods: This observational pilot study was conducted over three weeks throughout seven primary health care centers located in Beirut and Mount Lebanon Governorates. Lebanese adults aged between 18 and 64 years, and with a wide range of health status were invited to participate in the study. Physical activity was measured by the Arabic version of the International Physical Activity Questionnaire Long-Form. The American College of Sports Medicine's exercise preparticipation health screening questionnaire, and algorithm were used to judge readiness to exercise participation. The World Health Organization's physical inactivity indicator was used to document the prevalence of physical inactivity among adults.

Results: Data were collected from 339 participants with a mean age of 41.70 ± 12.89 years. Regarding the physical activity recommendations, less than 30% of the participants who reported doing moderate-intensity physical activity, accumulated a volume of ≥ 150 minutes.week⁻¹. Only 15.04% of those who reported doing vigorous-intensity physical activity, accumulated a volume of ≥ 75 minutes.week⁻¹. Interestingly, among all participants, only a few (1.77%) accumulated a volume of ≥ 600 MET-minutes.week⁻¹ of combined moderate-to-vigorous intensity physical activity. Physical inactivity was prevalent among 65.19% of Lebanese adults. Among the participants, 53.7% were judged not ready for exercise participation.

Conclusion: The majority of the adults didn't meet the physical activity recommendations set forth by the World Health Organization. Moreover, physical inactivity was found highly prevalent

among participants, and more than half of the participants were judged not ready to start an exercise program or should discontinue their current exercise participation.

Keywords— Non-communicable diseases, Physical activity, Physical inactivity, Primary health care, Adults

I. INTRODUCTION

Primary health care (PHC) is the first point of contact people have with a healthcare system. It provides comprehensive, accessible, and community-based services that meet 80 – 90% of individuals' health needs [1]. These services range from prevention to management of chronic health conditions and palliative care [1]. Moreover, PHC's main purpose is to care for people, rather than simply treating specific diseases or conditions [1].

The fields of physical activity (PA) and public health has been developing at a rapid pace during the past decades. In the early 1960s, both exercise and epidemiologic sciences converged to understand and tackle the heart disease epidemic [2]. To address these aims, research conducted during the late 80s showed that regularly performed moderate-to-vigorous PA reduced the risk of heart disease [3]. Moreover, evidence that supports the inverse relationship between regular exercise/aerobic capacity and premature mortality, risk of cardiovascular disease (CVD), and a lot of other negative health conditions continue to accumulate [4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16; 17]. Even PA accumulated in bouts of 10 minutes or less is associated with a lower incidence of hypertension, and lower resting blood pressure (BP) [18, 19, 20].

Despite the well-documented health benefits of PA, physical inactivity (PI) remains a global pandemic, identified as one of the four leading contributors to premature mortality from four major non-communicable diseases (NCDs), along with tobacco use, unhealthy diet, and harmful use of alcohol [21, 22]. Namely, these NCDs are CVDs, cancers, chronic respiratory diseases, and diabetes, which represent the biggest cause of death worldwide [23]. Globally, 31.1% of adults are physically inactive [21]. Therefore, to reduce PI, the World Health Organization (WHO) created age-related PA recommendations [24]. However, one in four adults didn't meet the WHO recommendations on PA to benefit from the reduced risk of common chronic

diseases [25]. Similarly, nearly 80% of adults didn't meet the key guidelines for both aerobic and muscle-strengthening activity, while only about half met the key guidelines for aerobic PA [2].

In order to reinforce national efforts to address the burden of NCDs, the 66th World Health Assembly endorsed the WHO Global Action Plan for the Prevention and Control of NCDs 2013-2020 [23]. The action plan provides a road map and a menu of policy options for all member states and other stakeholders, to take coordinated and coherent action, at all levels, local to global, to attain nine voluntary global targets with the overarching aim to reduce premature death from the four major NCDs by 25% by 2025 [23]. The Third target consists of reducing the prevalence of PI by 10% by 2025 [26]. Moreover, these nine targets are in line with the NCDs-focused target (Target 3.4) of the third health-related sustainable development goals (SDG3) [27]. Target 3.4 states that by "2030 (...) one-third premature mortality from non-communicable diseases" will be reduced "through prevention and treatment and promote mental health and well-being" [27].

Achieving these targets is feasible through high-level political commitment, government action, and support, and engagement from all stakeholders, to create a healthy environment needed to beat NCDs [28]. Evidence demonstrates that the burden of NCDs can be greatly reduced if cost-effective preventive and curative actions are implemented in an effective and balanced manner [2].

The mission of improving solely the level of PA to meet the WHO's recommendations is not sufficient. Scientific evidence demonstrates that exposure to high sedentary behaviors (SB) significantly increases the risk of all-cause mortality, CVD, cancer, and type 2 diabetes [2]. However, replacing SB with light-intensity physical activities is likely to produce some health benefits among physically inactive adults. Moreover, replacing SB with higher intensity (moderate-to-vigorous) physical activities may produce even greater benefits among all adults [2]. Therefore, moderate-to-vigorous PA should be part of every adult's lifestyle, especially for those who sit for longer periods [2].

Achieving universal health coverage (UHC) is the main goal of the Lebanese national health strategy. UHC aims to ensure universal access to services that address population health needs and country health priorities with adequate quality, without incurring households' financial ruin [29]. However, the Lebanese healthcare system's dilemma lies in the coverage of tertiary care and sophisticated treatments such as open-heart and joint replacement surgeries and expensive cancer patent drugs [29]. Yet paradoxically, PHC services are not universally covered. This might be partly due to the lack of accessibility to a comprehensive package of PHC services [29].

These findings are of public health importance because it suggests that engaging in PA, regardless of the length of the bout, may have significant health-enhancing effects, and is important to fight against NCDs. Therefore, to introduce a valuable as well as affordable service to the continuum of PHC and easing the access to UHC, this study's primary aim is to

evaluate the current PA status of Lebanese adults and their readiness to participate in an exercise program. Furthermore, a secondary aim is to measure the prevalence of adults' PI in Lebanon.

II. METHODS

A. Design

This study adopted an observational descriptive design, and ethics committee approval was obtained from the Lebanese German University's Institutional Review Board. To ensure confidentiality, participants' data were kept in a concealed place and accessed only by the principal investigator upon the need. Before enrolment, each participant received study-specific information from a trained assessor. Participants were allowed to ask as many questions as needed. Thereafter, participants informed voluntary consent was obtained by granting the assessors access to their data and by clicking "Yes" on the "approve to participate" statement in the online informed consent form.

B. Participants and Selection Criteria

Lebanese primary health care center (PHCC)s from Beirut and Mount Lebanon Governorates were selected for this study. Moreover, no major constraints were made on the selection criteria. Lebanese males and females between the age of 18 and 64, and with a wide range of health status were eligible to participate in the study. Consecutive cases sampling method was used to recruit participants.

C. Data Collection Methods

Physical Activity (PA) was assessed using the long version of the International Physical Activity Questionnaire (IPAQ), a subjective, reliable, and validated tool used in many countries [30]. IPAQ long-form (IPAQ-LF) assesses PA undertaken across a comprehensive set of domains including (a) work, (b) transportation, (c) domestic and garden (yard work), and (d) recreation, sport, and leisure-time. It also measures the time spent sitting. Moreover, IPAQ-LF addresses specific types of activities undertaken within each of the above-mentioned domains [31]. Domain-specific scores or activity-specific sub-scores may be calculated. The selected MET values were derived from work undertaken during the IPAQ reliability study conducted by Craig et al. [32]. The following values were used for the analysis of IPAQ data (a) Walking = 3.3 METs; (b) Moderate PA = 4 METs; and Vigorous PA = 8 METs [32].

Moreover, IPAQ-LF estimates the time spent sitting on a typical weekday, weekend day, and during travel. Time spent sitting is an additional indicator of time spent in SB and is not included as part of any summary score of PA. In these questions, 'Minutes' is used to reflect the time spent rather than MET-minutes [31].

For this study, the Arabic version of the International Physical Activity Questionnaire Long-Form (A-IPAQ-LF) was adopted. A-IPAQ-LF is culturally adapted and validated in the Lebanese population [33].

Readiness for exercise participation was evaluated by the American College of Sports Medicine

(ACSM) exercise preparticipation health screening (EPHS) algorithm, a tool designed to identify individuals who are at risk for cardiovascular complications during or immediately after aerobic exercise/PA [34].

The goals of the ACSM-EPHS process are to identify individuals (a) who should receive medical clearance before initiating an exercise program or increasing the frequency, intensity, and/or volume of their current program, (b) with clinically significant disease(s) who may benefit from participating in a medically supervised exercise program, and (c) with medical conditions that may require exclusion from exercise programs until those conditions are abated or better controlled [34].

The updated ACSM-EPHS process is based on an algorithm with recommendations for medical clearance based on (a) an individual's current PA participation; (b) presence of signs or symptoms and/or known CVDs, metabolic, or renal disease, (c) and the anticipated or desired exercise intensity [34]. Moreover, an EPHS questionnaire was used to guide the assessor throughout the screening process [34]

D. Procedure

Seven PHCCs were selected to represent the source of participants' recruitment. Four were located in Mount Lebanon Governorate and distributed across three Districts (Two in Baabda, one in Keserwan, and one in Chouf). The remaining three PHCCs were located in three different regional areas in Beirut Governorate to capture a wider spectrum of distribution.

Before the empirical phase, eight assessors and one study coordinator attend three days' workshop, where they were trained by the principal investigator. Background information about PA, NCDs, and their risk factors, and standardization of the data collection protocol were provided during the workshop. Moreover, the team familiarized themselves with and practiced the use of the data collection methods. To preserve the participants' confidentiality, a paperless process for data collection was adopted. An online informed consent form was designed using Google Forms (Google LLC).

Data were collected over three weeks. After enrolment, each participant was invited to an interview conducted by the same assessor. Data collection order was standardized and respected the following sequence (a) demographic data and consent, (b) ACSM-EPHS questionnaire, and (c) A-IPAQ-LF.

E. Statistical Analyses

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 21.0 for Windows (SPSS Inc. Version 15.0, Chicago, IL, USA). Descriptive statistics such as (a) measures of center (median, mean), (b) measures of variation (standard deviation), (c) and measures of position (quartiles) were used to summarize the variables in the dataset.

The sample size was calculated using Cochran's equation ($n_0 = Z^2 pq / e^2$) [35]. Where " n_0 " is the sample size, " Z " is the abscissa of the normal curve that cuts off an area α at the tails. A confidence level of 95% ($\alpha = 5\%$), was considered for this formula, with " Z " equal 1.96.

"e" is the desired level of precision (5%), "p" is the estimated proportion of an attribute that is present in the population (20%), and "q" equals "1-p" (80%). The estimated sample size yielded 246 participants.

Protocol for continuous measures scoring.

Continuous measures collected from the A-IPAQ-LF were reported in two ways. The first way represented domain-specific scores, for walking (W), moderate-intensity activities (M), and vigorous-intensity activities (V). The second way included computation of activity-specific, and time spent sitting scores across the five domains. The intensity of activities as defined by the energy requirements in METs values represented multiples of the resting metabolic rate. The volume (MET-minute.week⁻¹) is computed by multiplying the intensity of activity (METs), by the duration (minutes), and the frequency (days) spent doing the activity [30].

The average total sitting time during a day (minutes/day) was computed by performing the following formula: $([A \text{ weekday (sitting minutes)} \times 5] + [A \text{ weekend day (sitting minutes)} \times 2] + [\text{Traveling in a motor vehicle (sitting minutes)} \times \text{day}]) / 7$ [30]. Given the non-normal distribution of energy expenditure in many populations, the IPAQ research committee proposes that the continuous indicator be presented as median minutes.week⁻¹ or median MET-minutes.week⁻¹ rather than means [30].

Data processing rules. In addition to a standardized approach to computing measures of A-IPAQ-LF, standard methods for data processing were deemed necessary. Standardization in data processing avoids the introduction of variability that reduces the comparability of data. Therefore, the rules introduced by the IPAQ research committee regarding (a) data cleaning, (b) maximum values for excluding outliers, and (c) recording minimum values for the duration of activity are followed in the analysis [30].

III. RESULTS

Data were collected from 339 participants with a mean age of 41.70 ± 12.89 years. The age variable was further subcategorized into five different groups for further subgroup analysis (Table I). Females accounted for 65.5% of the total participants. Moreover, Mount Lebanon Governorate accounted for the highest percentage of participation (73.2%) (Table I).

A. Physical Activity Status

Domain-specific physical activity. More than half of the participants (59%) reported that they did work, among those, half reported no walking, or any moderate/vigorous-intensity PA at their work (Table II). Moreover, 75% of participants reported that they didn't use cycling to commute. In the "Domestic and Garden (yard work)" domain, 50% of adults reported that they participated only in inside home moderate-intensity PA for less than 120 min.week⁻¹ (Table II). It is also notable that 75% of the adults reported no participation in moderate/vigorous-intensity PA in their leisure-time (Table II).

TABLE I. DEMOGRAPHIC CHARACTERISTIC OF PARTICIPANTS

	Mean (SD) [Years]	Median [Years]	Range [Years]	Minimum-Maximum [Years]
Age	41.7 (\pm 12.89)	42	46	18-64
Gender	Percentage (%)		Age Groups	Percentage (%)
Male	34.5		18-27	15.9
Female	65.5		28-37	26.8
Governorate	Percentage (%)		38-47	21.2
Beirut	26.8		48-57	21.8
Mount Lebanon	73.2		58-67	14.2

SD: Standard deviation

TABLE II. SUMMARY STATISTICS OF DOMAIN-SPECIFIC PHYSICAL ACTIVITY

Domains	Minimum (min.wk ⁻¹)	Maximum (min.wk ⁻¹)	Quartiles (min.wk ⁻¹)		
			25	50	75
Work					
Moderate-intensity	0	2940	0	0	105
Vigorous-intensity	0	2520	0	0	0
Walking	0	2880	0	0	0
Active Transportation					
Walking	0	2240	0	30	140
Cycling	0	280	0	0	0
Domestic & Garden					
Vigorous-intensity (Garden/Yard)	0	2520	0	0	0
Moderate-intensity (Garden/Yard)	0	960	0	0	0
Moderate-intensity (Inside home)	0	3360	0	120	630
Leisure-Time					
Walking	0	2100	0	0	90
Vigorous-intensity	0	840	0	0	0
Moderate-intensity	0	840	0	0	0

SD: Standard deviation; Min.wk⁻¹: Minutes per week

Maximum energy expenditure was recorded in the “Work” domain (25416 MET-minutes.week⁻¹), however, 75% of the participants reported that they achieved less than 802.5 MET-min.week⁻¹ (Table III).

TABLE III. SUMMARY STATISTICS OF TOTAL DOMAIN-SPECIFIC PHYSICAL ACTIVITY

		Total	Work	Total	Total	Domestic &	Total	Leisure-
		(MET-minutes/week)						
Minimum		0		0		0		0
Maximum		25416		7392		18900		8478
Quartiles	25	0		0		0		0
	50	0		99		540		0
	75	802.5		495		1890		693

Nevertheless, when gender-specific data were analyzed, the highest median of energy expenditure was recorded by females in the “Domestic & Garden” domain (1,170 MET-minutes.week⁻¹) (Fig. 1).

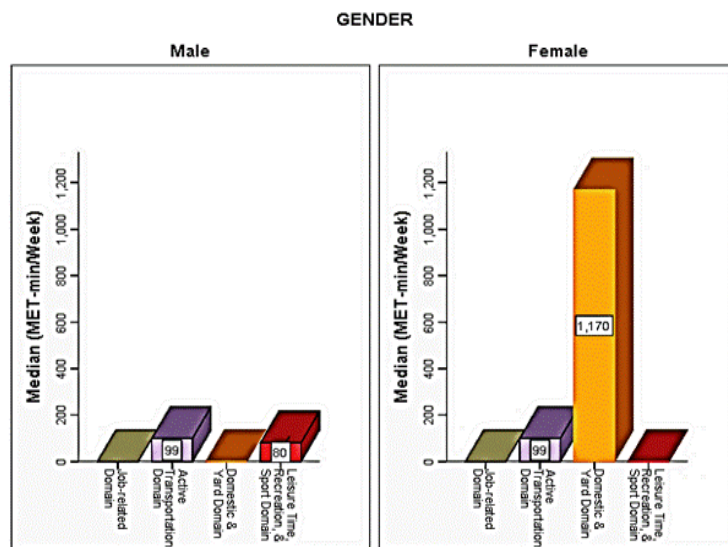


Fig. 1. Bar chart showing median values of total physical activity performed in MET-min.week⁻¹ by domain and gender.

Activity-specific physical activity. Age and gender-specific subgroups analysis revealed that male participants of the age group (28-37), scored the highest median (473 minutes.week⁻¹) of total walking as compared to the remaining categories of both genders (Fig. 2).

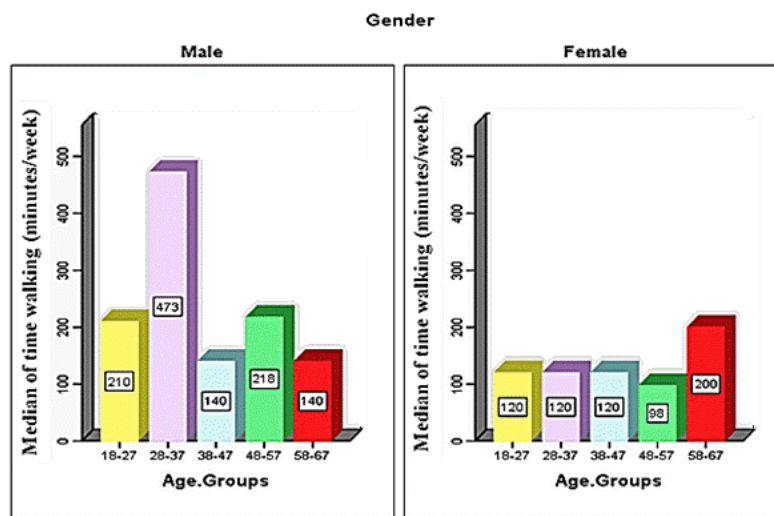


Fig. 2. Median of walking time per week by gender and age.

Among the whole participants, few (1.77%) were able to meet the combined equivalent volume of ≥ 600 MET-minutes.week⁻¹ of moderate-to-vigorous PA, while 7.67% were able to meet both moderate and vigorous PA recommendations (Fig. 3).

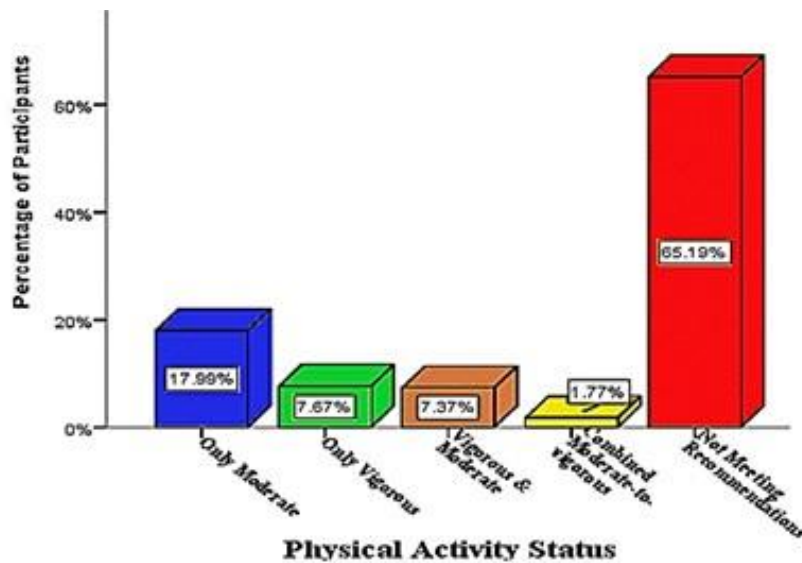


Fig. 3. Percentage of physical activity status distribution among adults.

Regarding the reported moderate-intensity PA volumes, about 8.26% of adults residing in Beirut and Mount Lebanon Governorates accumulated ≥ 150 to 300 minutes.week⁻¹ of moderate-intensity PA. Moreover, 17.11% accumulated >300 minutes.week⁻¹, and 16.52% accumulated between 10-149 minutes.week⁻¹ of moderate-intensity PA. The remaining participants didn't accumulate any moderate-intensity PA. On the other hand, concerning the vigorous-intensity PA, 5.01% of participants reported a volume of ≥ 75 -150 minutes.week⁻¹. Furthermore, 10.03% reported a volume of >150 minutes.week⁻¹, and 6.19% accumulated between 10-74 minutes.week⁻¹ of vigorous-intensity PA. The remaining participants didn't accumulate any vigorous-intensity PA (Fig. 3).

Among participants who met the PA recommendations, males and females in the age category (28-37) scored the highest percentage as compared to the remainder age categories (Fig. 4).

Both male and female participants spent a lot of sedentary time. Yet, males recorded the highest median of time spent during SB (430 minutes.day⁻¹), as compared to the females (379 minutes.day⁻¹).

B. Physical Inactivity Prevalence

Data about PI was recorded using the WHO's indicator "age-standardized prevalence of insufficient physically active persons aged 18+ years". According to the formula:

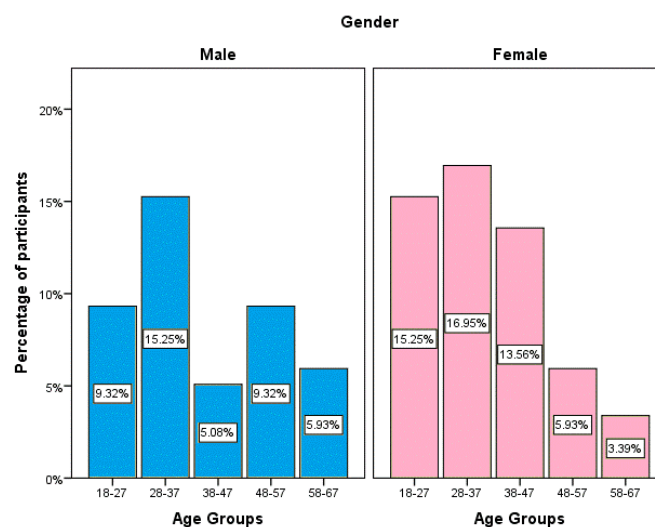


Fig. 4. Distribution of participants meeting physical activity recommendations by age and gender.

Physical inactivity prevalence

$$= \frac{\text{Number of respondents age 18 + years not meeting the criteria for physical activity}}{\text{Number of survey respondents age 18 + years}} * 100$$

Physical Inactivity Prevalence = 227/339 = 65.19%.

C. ACSM Exercise Preparticipation Health Screening

More than half of the adults didn't report any symptom (51.9%) or medical condition (82.9%). Moreover, 74.3% reported no participation in regular PA. Readiness for exercise participation decision was based on ACSM's algorithm that combines data about symptoms, medical conditions, and participation in regular PA. Accordingly, 53.7% of the participants were judged not ready to participate in an exercise program or should discontinue their current exercise participation. Furthermore, subgroups analysis based on gender and age showed that females were less ready for exercise participation across their age-categories than males (Fig. 5).

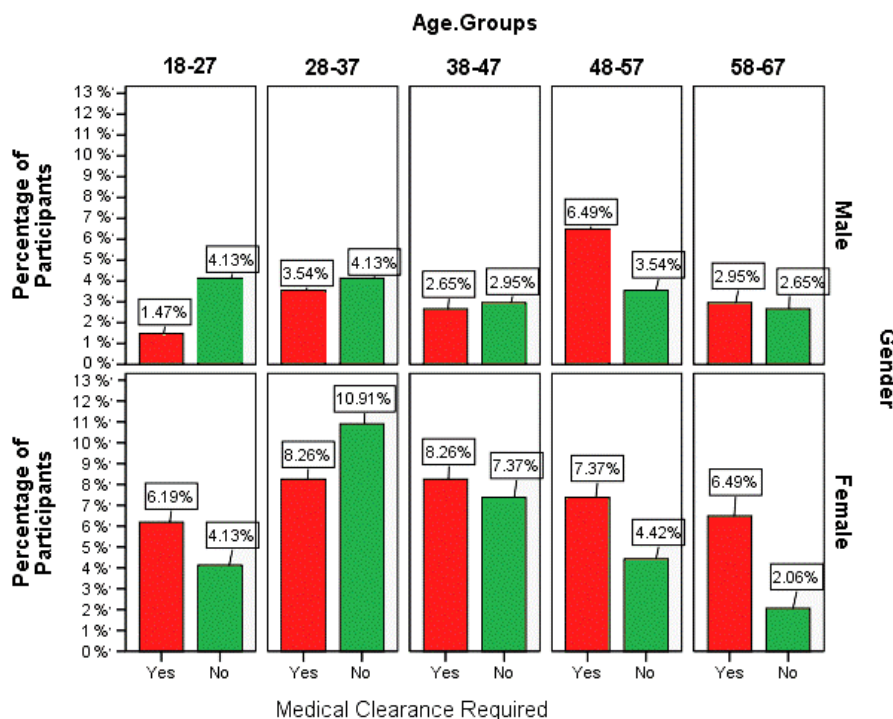


Fig. 5. Distribution of the need for medical clearance by age and gender.

IV. DISCUSSION

Major NCDs are the world's leading cause of death worldwide. Most of the premature deaths from NCDs are largely preventable by enabling health systems to respond more effectively and equitably to the health-care needs of people with NCDs, through a multisector approach to tackle shared risk factors. Among these risk factors, the top-rated are tobacco use, unhealthy diet, PI, and the harmful use of alcohol [23].

This pilot study shows that 50% of working participants reported their lack of participation in any walking, moderate, or vigorous PA during work. This is partly explained by the fact that mechanization reduced the number of jobs requiring substantial amounts of PA. This fact is similarly reported in the United States of America [2]. Moreover, 75% of participants reported not

using cycling as a method of transportation. The reasons behind this might be multifactorial, such as the Lebanese culture, and attitude toward riding bikes, or the design of roads which are not bike-friendly. It is noteworthy to mention that the majority of adults (75%) reported no involvement in either moderate or vigorous-intensities under the "Leisure-time" domain. This might be attributed to the lack of perceived benefits of PA, gender restrictions, and environmental determinants.

Around 25.37% of adults residing in both Beirut and Mount Lebanon Governorates reported successfully meeting or exceeding the internationally recommended target range of moderate-intensity PA (150-300minutes.week-1), whereas, only 15.04% met or exceeded the internationally recommended target range of vigorous-intensity PA (75-150 minutes.week-1). Each of the intensity categories mentioned above (moderate

and vigorous) included participants who reported achieving only intensity-specific recommendations and those who reported meeting both recommendations (vigorous and moderate). However, only a few of the whole participants (1.77%) were able to achieve the combined volume of ≥ 600 MET-minutes.week⁻¹ of moderate-to-vigorous PA. Cumulatively, only 34.81% of Lebanese adults were able to meet the international PA recommendations. These findings are also confirmed by Ding (2018) [24], where he found that one in four adults do not meet the WHO recommendations on PA. Similarly, only about half of adults met the key guidelines for aerobic PA [2]. Interestingly, this low percentage in meeting age-specific PA recommendations was combined with an increased time spent during SB.

PI has been identified as the fourth leading risk factor for global mortality (6% of deaths globally), with high BP leading the list (13%), followed by tobacco use (9%) and high blood glucose (6%) [36]. The prevalence of PI found among our participants reached 65.19%. This percentage is much higher than the global percentage reported by Hallal et al. in 2012 [21], which attained 31.1% of adults.

Based on the ACSM algorithm, 53.7 % of the participants were judged not ready to start an exercise program or should discontinue their current exercise participation.

Various limitations confronted this study. The collaboration of the assessors and the study's coordinator were done on a pro bono basis, due to financial constraints and the lack of funding. Moreover, the lack of support from the MoPH narrowed the selection of PHCCs, where more than 10 centers between Beirut and Mount Lebanon refused to cooperate without the MoPH's approval. Finally, the Coronavirus pandemic reduced the planned study period from six to only three weeks.

V. CONCLUSION

Despite the widely documented benefits of PA, this study shows that the majority of the Lebanese adults residing in Beirut and Mount Lebanon Governorates didn't meet the international PA recommendations. Moreover, Lebanese adults spent too much daily time in SB which made PI highly prevalent among the participants. Finally, more than half of the participants were judged not ready to start an exercise program or should discontinue their current exercise participation.

This pilot study provides a foundation for conducting future studies. It is planned to replicate this study protocol over the remaining Lebanese Governorates, to derive national comprehensive and representative data. The aim is to develop national PA guidelines that will guide the implementation of PA strategies and approaches at the individual and community levels. Readiness to exercise participation as well as other PA health promotion and prescription services are expected to be delivered by PHCCs across Lebanon, to reduce the prevalence of PI and by this combat the burden of NCDs.

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