Peritoneal dialysis: Experience of the Department of Pediatrics of the Hospital Charles Nicolle of Tunis

Dialyse péritonéale: expérience de service de Pédiatrie de l'Hôpital Charles Nicolle

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RÉSUMÉ

Introduction : La dialyse péritonéale (DP) est la modalité de dialyse la plus fréquemment utilisée dans la prise en charge des enfants atteints d'insuffisance rénale terminale (IRT). L'objectif de cette étude est d'étudier les facteurs épidémiologiques, cliniques et bactériologiques qui peuvent influencer le devenir de la DP.

Méthodes : Nous avons effectué une étude rétrospective colligeant 85 patients sous DP sur dix ans (Janvier 2004 -Décembre 2013) au service de pédiatrie de l'Hôpital Charles Nicolle de Tunis.

Résultats : La durée totale moyenne de la DP était de 18,1±12 mois (3,5–75mois). L'âge moyen de début de la DP était de 9,3±5,7 ans (29 jours-23 ans). Le sex-ratio était égal à 1,5. Les étiologies de l'IRT étaient dominées par les uropathies malformatives. Soixante-quatorze de nos patients (87 %) avaient bénéficié d'une DP automatisée. Le délai moyen entre la mise en place du cathéter et le début de la DP était de 3,9±4,6 jours. Le nombre moyen de changement du cathéter par patient était de 1,62 (1-5). Soixante et un patients (71,8%) avaient présenté au moins 1 épisode de péritonite infectieuse (PI). Les germes isolés étaient des Gram positif dans 61% des cas. La survie sans PI était de 40%, 32% et 18% respectivement au 12ème, 24ème et 36ème mois. L'arrêt définitif de la DP avait été indiqué 66% des patients et était imputé aux épisodes de PI dans 19,7% des cas.

Conclusion : Compte tenu de l'incidence importante de PI chez nos patients, une prévention primaire ciblée doit être menée.

MOTS-CLÉS

Dialyse péritonéale, péritonite, insuffisance rénale terminale, enfant

SUMMARY

Introduction: Peritoneal dialysis (PD) is still the most common modality used in treatment for children with End Stage Renal Disease (ESRD). The objective of this study was to identify the epidemiological, clinical, and microbiological factors affecting the outcome of PD.

Methods: In this study, we retrospectively reviewed the records of 85 patients who were treated with DP for the last ten years (from January 2004 to December 2013) in the Department of Pediatrics in Charles Nicolle hospital, Tunis.

Results: The mean duration of PD was 18.1±12 months (3.5–75 months). The average age of PD onset was 9.3±5.7 years (29 days-23 years). The sex ratio was 1.5. In a significant number of cases with ESRD, the primary cause is Congenital Anomalies of the Kidneys and Urinary Tract (CAKUT). Seventy-four of our patients (87%) had been treated with Automated PD. The average time between catheter placement and PD commencement was 3.9±4.6 days. Catheter change was 1.62 (1-5). Sixty-one patients (71.8%) had experienced at least one episode of peritonitis. The most frequently isolated organisms was the Gram-positive bacteria (61%). Survival rates without peritonitis at 12th, 24th and 36th months were 40%, 32% and 18%, respectively. Transition to permanent hemodialysis was required in 66% of patients.

Conclusion: Considering the important incidence of peritonitis in our patients, it is imperative to establish a targeted primary prevention.

Key-words

Peritoneal dialysis, peritonitis, children, end stage renal disease

Exercise tolerance is usually expressed in terms of maximal oxygen consumption measured during a cardiorespiratory test realized under optimal safety conditions and in the presence of a physician and a technician [1]. However, the cardiorespiratory test requires sophisticated equipment, and must be operated by highly qualified personnel [1]. Thus, the repeated use of such a test represents a significant financial cost and cannot be performed on a large scale [1]. These drawbacks led to resorting to more simple tests such as the 6-min walk-test (6MWT) [2-4].

The 6MWT is safer, easier to administer, better tolerated, and better reflects activities of daily living than other walk-tests [2-4]. It is also inexpensive and feasable on a large scale [2-4]. It involves measuring the distance a subject/patient can walk on a level course in 6 minutes (6MWD) [2-4]. The growing popularity of this test is due to its simplicity and to the fact that it does not require sophisticated equipment and can be easily performed by even the most severely debilitated patients [2-14]. The test has been extensively used for preoperative and postoperative assessment and for measuring the response to therapeutic interventions for respiratory and cardiac diseases [2-4]. In addition, the 6MWT can be performed by several elderly, weak, and rigorously limited patients who cannot be evaluated with standard maximal cycle ergometer or treadmill exercise tests [15]. Moreover, it independently predicts the risk of death among patients with chronic diseases [2-4, 7, 8, 12, 13, 15-17].

The interpretation of the 6MWT, which is more reflective of daily life activities than other walk-tests [2-4], relies on the comparison between measured 6MWD and the predicted value derived from norms [2, 3, 18-48]. These reference equations [2, 3, 18-48] are often based on sex and anthropometric data (eg; age, height and weight) [2-5]. The influence of race and/or ethnicity is still ambiguous [2, 30].

Numerous other physiological factors can influence the 6MWD in healthy subjects and in patients with chronic conditions, such as muscle strength, symptoms of depression, health-related quality-of-life impairment, cognitive deficit, medication use, arthritis and other musculoskeletal disorders, systemic inflammation and pulmonary function alterations [2-5]. 6MWD can also be influenced by external factors, such as the effort spent and the motivation [49]. Some other specific influencing factors were noted such as parity and socioeconomic and schooling levels (SEL, SL, respectively) [18].

While several reviews and guidelines were published concerning the 6MWT [2-5], to the best of authors' knowledge, no previous review was performed to identify the 6MWD influencing factors of Arab population. Therefore, the purpose of the present review is to highlight and discuss the 6MWD influencing factors in the Arab populations.

METHODS

The present review includes a literature search, from 1970 to September 31th 2015 using the PubMed, the Science Direct databases and the World Wide Web on Google search engine. Reference lists of retrieved English/French articles were searched for any additional references.

The included key-words were the following: "influencing factor" AND [("six minute walk distance" OR "six-minute walk distance" OR "6-minute walk distance" OR "six-min walk distance" OR "6-min walk distance" OR "six minute walking distance" OR "six-minute walking distance" OR "6MWD" OR "six-minute walk" OR "6-min walk" OR "six-min walk test" OR "six minute walk test" OR "six-minute walk test" OR "6-minute walk test" OR "6-min walk test"OR "6MWT" OR "walk test" OR "walking")] AND [("reference equation" OR "reference value" OR "standard reference")] AND (Adult) AND (Arab).

RESULTS

Six studies were included [18-23]: two of which were about Tunisian population [18, 19], three about Saudi-Arabian population [20-22] and one about Algerian population [23]. Five studies were cross-sectional [18-21, 23] and one was a case-control study [22].

Recruitment methods, samples representation and non-inclusion criteria

Table 1 displays the included six studies recruitment methods, sample representation and non-inclusion criteria.

Different recruitment methods were applied. Subjects were recruited among: visitors of hospitalized patients [19] or of university [20], hospital [18, 23] or university [20, 23] or company [20] workers and/or employees, of medical school students' parents [18, 23] and public school teachers or students [20]. El-Sobkey et al. [21, 22] have opted for a verbal request and/or an invitation from the community [21] or local campus [22]. In the Algerian study [23], subjects aged 16-18 years were Hospital and Medical School workers' offspring.

All included samples were convenience ones. In the study of Masmoudi et al. [19], 55% and 44% of included subjects were, respectively, urban and illiterate. Percentages of subjects with low physical activity score or level were 82% in Ben Saad et al. study [18], 80% in Alameri et al. study [20], 51% in El-Sobkey study [21] and 26.5% in Bourahli et al. study [23]. Twenty four percent and 64% of included subjects in the studies of Ben Saad et al. [18] and of El-Sobkey [21] have, respectively, moderate obesity and inacceptable weight. In the study of Bourahli et al. [23] only 5% and 4.5% of subjects have, respectively, moderate obesity and underweight. In

Alameri et al. study [20], a non-neglected percentage of overweight subjects were included. In one study [18], 43% and 36% of included subjects have low SL and SEL, respectively. In the case-control study of El-Sobkey et al. [22] 50% of included women were niqab-wearing. Since, the Algerian study [23] was performed in the region of Constantine (649 m above sea level) the factor of altitude should be taken into account when comparing between study data.

Table 1: Patient's characteristics

Characteristics	n=85	Pourcentage %
Age of PD commencement		
<2 years	16	19
2-5years	13	15
>6years	56	66
Sex		
Male	51	60
Female	34	40
Sex-ratio	1,5	
Causes of ESRD		41
CAKUT	35	33
hereditary	28	13
glomerulonephritis	11	7
unknown	6	6
Others	5	28
Hypotrophy	24	47
History of urinary tract infection	40	10,5
Abdominal surgery history	9	8
Vesicostomy	7	5
Nephrostomy	4	5
Ureterostomy	4	14
Enuresis	12	12
Anuria	10	

PD : peritoneal dialysis ; ERSD : end renal stage disease
CAKUT: Congenital Anomalies of the Kidneys and Urinary Tract

Several non-inclusion criteria were applied. Only three studies [18, 20, 23] have looked for the 6MWT contraindications [4] (unstable angina or myocardial infarction during the previous month; resting heart-rate (Hr) ≥ 120 bpm, resting systolic or diastolic blood pressures, respectively ≥ 180 mmHg and ≥ 100 mmHg). Other non-inclusion criteria were applied: active lifestyle [19, 22], smoking [18-20, 22, 23], chronic or acute disorders [18-21, 23], recent upper-respiratory tract infections [20], thoracic or abdominal surgery [20, 23], orthopedic disease interfering with walking [18, 20, 23], chronic medication use [18, 22, 23], body-mass-index (BMI) < 18.5 kg/m^2 [18, 22] or > 35 kg/m^2 [18, 20, 22, 23], ventilator-obstructive-defect [18, 20, 23], tendency to a restrictive-ventilatory-defect [23], previous experience of 6MWT [18, 23], inability to perform the 6MWT exactly [18, 23], resting oxy-hemoglobin saturation (oxy-sat) ≤ 92% [18, 23], end-walk dyspnoea > 5/10 (visual-analogue-scale) [18, 23] and walking induced desaturation [18, 23].

6MWT applied protocols

Table 2 displays some characteristics of the 6MWT-applied protocols in the included six studies. In the two studies carried out by El-Sobkey et al. [21, 22], no information was given about either the number of performed 6MWT or the corridor length. One study has performed only one test [20] and three studies [18, 19, 23] have performed two 6MWT with 30 [18, 19] or 20-45 [23] minutes rest between tests. The corridor length is in three studies [19, 20, 23] and in another one [18]. The six studies have applied the American-thoracic-society (ATS-2002) guidelines [4]. In the studies of El-Sobkey et al. [21, 22], no information was given about either the given encouragement or the time of test or the ambient temperature. Standared phrases of encouragement were given in two studies [19, 23], and no encouragement was given in two others [18, 20]. 6MWTs were performed in the morning in three studies [18, 20, 23] and in the afternoon in one study [19]. Ambient temperature is mentioned only in three studies [18, 20, 23].

Table 2 : Distribution of different organisms isolated on peritoneal dialysis fluid

Bacteria	Number	Pourcentage (%)
Gram-Positive		
Staphylococcus aureus	20	20,6
Staphylococcus epidermidis	7	7,2
Enterococcusfaecalis	2	2,1
Staphylococcus hominis	2	2,1
Gemellamorbillorum	1	1
Staphylococcus lugdunensis	1	1
Gram-Negative		
Klebsiellapneumoniae	5	5,2
Pseudomonas aeruginosa	5	5,2
Acinetobacterbaumanii	4	4,1
Enterobacteraeruginosa	4	4,1
Klebsiellaoxytoca	2	2,1
Echerichia coli	1	1
Enterobactercloacae	1	1
Serratiaodorifera	1	1
Fungal		
Candida albicans	1	1
Negative culture	40	41,3
Total	97	100

Table 3 displays the six studies sample sizes and age and 6MWD data of the included subjects. The sample sizes varied from 40 [22] to 359 [21] subjects. Included subjects were aged from 16 [20, 23] to 85 [18] years. The 6MWD (m) varied from 410±52 [20] to 680±70 [23] for the total sample and from 371±63 [22] to 634±49 m [23] and from 430±47 [20] to 726±55 [23], respectively, for women and for men. The 6MWD divergence reflects disparities in how 6MWT protocol was conducted (corridor length, encouragement, motivation aspects', etc.), applied non-inclusion criteria, sample sizes, different characteristics of *recruited subjects (Tables 1 and 2). Subjects' submaximal effort could also be considered as a possibility [23].*

Influencing factors

Table 4 displays the 6MWD influencing factor of adult Arab populations. The following anthropometric influencing factor were reported in the six included studies: sex [18-21, 23], age [18-20, 23], height [19, 20, 23], weight [20], BMI [18-20, 23] and lean-mass [23]. Some other influencing factors were also noted: SL [18, 19], SEL [18], urban origin [19], parity [18], physical activity score or status [18, 21, 22], metabolic-equivalent-task (MET) moderate activity [23], some spirometric data [18, 23], end-walk Hr [20], resting diastolic-blood-pressure [23], dyspnoea Borg value [20], niqab-wearing (yes/no) and niqab wearing time [22].

DISCUSSION

The six studies included in the present review show that the 6MWD performed by adult Arab population is influenced by anthropometric data (sex, age, height, weight, BMI and lean-mass), schooling and socioeconomic levels, urban origin, parity, physical activity score or status, some spirometric data, end-walk heart-rate, resting diastolic-blood-pressure, dyspnoea Borg value and niqab-wearing.

Information about factors influencing the 6MWD in healthy subjects of a wide age range have been published [2-5, 18-48, 50]. Anthropometric data [sex, age, height, weight, BMI and lean-mass] explain from 20% to 78% of 6MWD variability.

Anthropometric data effects

Sex effect. Sex is a consistent factor that has been described in several studies [2-5]. In general, men have a higher 6MWD than women (Tables 3 and 4). One plausible explanation is that muscle mass and therefore maximum leg-muscle force is lower in women than in men [18].

Age effect. In adults, age has a significant influence on the 6MWD: the 6MWD declines with ageing (Table 4). The 6MWD decline with age could be explained by the gradual reduction of muscle mass, strength and endurance (thus, defining sarcopenia), responsible of inactivity in elderly people [51-53]. Indeed, in subjects above 40 years of age, muscle mass decreases by an average of 5% per decade [54]. Other explanation of the 6MWD decline with age could be the prevalence increase of debilitating pathologies due to ageing [40, 55, 56].

Height effect. The significant effect of height on the 6MWD was attributed to a longer stride in taller individuals [40]. The stride length is one of the foremost determinants of gait velocity [57].

Obesity (weight and BMI) effect. Obesity raises the workload for a given exercise intensity, reducing the 6MWD [58]. In Ben Saad et al. [18] and Bourahli et al. [23] studies, when the BMI of included healthy subjects' increases by one unit, their 6MWD decreases, respectively, by six and 10 m.

Lean-mass effect. The Algerian study [23] reports a slight but significant contribution to the lean-mass in the total sample 6MWD variability: a one kg lean mass increase leads to a 1.6 m increase in 6MWD. This confirms that lean-mass is a predictor of exercise capacity in healthy subjects [59]. Moreover, an elevated quantity of lean-mass proved to have a foremost impact on 6MWD [25]. In the same way, a heavier subject would require supplementary energy while walking to maintain an inflated weight and thus restraining the maximal intensity of effective effort [33]. However, 6MWD was comparable in chronic-obstructive-pulmonary-disease (COPD) patients with and without lean-mass decrease, signifying that skeletal muscle has a partial impact on 6MWD [60].

Other 6MWD influencing factors

In addition to anthropometric data, other data were considered as 6MWD influential factors. Nevertheless, the relationships between 6MWD and some potential factors [physical activity levels, resting spirometric data or blood pressure, SL, SEL, niqab-wearing, urban origin, end-walk Hr, end-walk dyspnoea Borg value] are rarely evaluated [2-5, 18-48, 50]. In addition, the relationship between 6MWD and parity, a particular factor in developing nations (Europe and North America [61], North Africa [62]); was evaluated only in one study [18].

SL, SEL and urban origin effects. SL, which is defined according to education level [low (illiterate, primary education) and high (secondary and university education)] was found to slightly but significantly contribute to the 6MWD variability [18]: it justified an additional 2.2% of the 6MWD variance [18]. In Masmoudi et al. study [19], it was noted that the "higher the SL was, the longer the 6MWD". In an American study [56], high SL was a non-significant independent predictor of 6MWD. SEL, defined according to occupational status [low (eg; unskilled worker, jobless) and high (eg; skilled worker, farmer, manager) [63]], was found to slightly but significantly contribute to the 6MWD variability [18]: it explained an additional 0.2-1.5% of the 6MWD variance. In Masmoudi et al. study [19], compared to rural subjects, urban ones proved to have a significantly higher 6MWD. SL and SEL and urban origin should be taken into consideration when interpreting the 6MWD of patients/subjects suffering from a precarious situation.

Parity effect. Significant negative univariate linear correlation was found between Tunisian women 6MWDs and parity [18]. Moreover, parity appeared to be a negative independent variable included in the Tunisian forward linear stepwise multiple regression models for

6MWD. Data analysis of the two parity subgroups of women aged 45-59 years who differed only in parity found that the 6MWD was significantly lower in the high parity (> 6, n=38) vs. low parity (£ 5, n=38) groups (589±60 vs. 555±; respectively). These results may be clinically relevant when interpreting 6MWD in women with chronic diseases. As parity was not entered into their final norms [18] and as the 6MWD was lower by ~35 m in women with high parity, the authors [18] suggest solving this problem by subtracting from the lower-limit-of-normal of Tunisian women. The decline of the 6MWD with parity increase may reflect general findings about aging and parity effects on health [64-68]. Several hypotheses have been previously advanced: hormonal alterations, biochemical modifications and impaired respiratory muscle [18]. The medical literature provides very little information on the influence of parity on exercise tolerance. However, the effects of repeated gestations on 6MWD should now be taken into account. Two recent studies showed that high parity is associated with lower 6MWD in patients with type 2 diabetes-mellitus [8] or with severe obstructive-sleep-apnea-hypopnea-syndrome [17]. This may be a promising new direction towards physiological and pathophysiological research, particularly in developing countries.

Physical activity status effect. In four studies, physical activity was significantly correlated with 6MWD [18, 21-23]. In a sedentary healthy population (82% were sedentary) [18], physical activity score [69] was found to slightly but significantly contribute to the 6MWD variability: it explained an additional 1.1 to 4.4% of the 6MWD variance. In the Algerian study [23], the 6MWD value was 36 m lower in non-active adults (n=146) when compared to active ones (n=54). In addition, the MET moderate activity [70] explained an additional 0.3 to 2.6% of the 6MWD variance. In another study [21], where physical activity status was calculated using the last 7-days international physical activity questionnaire [70], in all age groups, significant increase in 6MWD from low, moderate, to high physical activity level was found. In addition, physical activity level was a predictor factor for 6MWD of Saudi healthy subjects [21]. Similar data were found by the same authors in another case-control study [22]. According to Alameri et al. [20], differences in the reported 6MWD of Saudis and other populations may stem from higher rates of physical inactivity rather than anthropometric characteristics. In fact, there is a high prevalence of physical inactivity among Saudis, particularly those who are middle-aged [71, 72]: up to 80% adult Saudi males are inactive, which exceeds values reported for other Westernized countries [73]. Decreased physical activity (ie; inactivity) usually leads to altered muscle metabolism, decreases in muscle mass and lower physical capacity [74]. This relation is more obvious among patients with co-morbid conditions, in which the rate of inactivity correlates significantly with 6MWD [8, 75].

Resting spirometric effect. The better the resting spirometric data were, the greater the 6MWD [18, 23, 37]. Earlier researchers used the 6MWD as a measure of the COPD severity and an outcome measure in COPD treatment [76, 77]. Camarri et al. [37] were the first to report a significant correlation between 6MWD and 1st-second-forced-expiratory-volume (FEV_1) in healthy subjects: FEV_1 was a significant independent predictor and explained an additional 4.5% of the 6MWD variance. Ben Saad et al. [18] and Bourahli et al. [23] found FEV_1 to be the first independent variable included in the 6MWD norms: alone it explains 55% and 50% of the Tunisian [18] and Algerian [23] 6MWD total samples variabilities. Significant correlations were also observed between 6MWD and FEV_1 [26, 42] or forced-vital-capacity (FVC) [26]. In community-dwelling elderly women [37], lower FEV_1 was a strong independent predictor of a lower 6MWD. In practice, spirometric data are not as easily assessed, as anthropometric ones, since spirometers are necessary to quantify pulmonary function.

End-walk dyspnoea Borg value effect. In the study of Alameri et al. [20] dyspnoea Borg value was negatively correlated with 6MWD. Dyspnoea may be an important determinant of the 6MWD in patients with chronic respiratory disease [78-81], which reflects both the physiology of exercise limitation [82, 83] and the impact of exercise limitation on daily life [84].

End-walk Hr effect. In the study of Alameri et al. [20] end-walk Hr value was negatively correlated with 6MWD. Some other studies have reported that end-walk Hr expressed as a percentage of the predicted maximum Hr (%Hrend) [20] or the difference between resting and end-walk Hrs (ΔHr) [25] were significantly correlated with 6MWD measured in healthy subjects. The result observed by Alameri et al. [20] was similar to other results observed in other populations [25, 42, 43], with significant correlations between the 6MWD and ΔHr [25] or %Hrend [42, 43]. Though the interference of Hr in the 6MWD has been recommended and considered essential [20, 24, 25, 42, 43], only some studies [25, 42, 43] have considered these variables in their 6MWD reference equations. Poh et al. [43] consider the %Hrend in the equation as well as age, height, and weight and elucidated 78% of the 6MWD variability. Jenkins et al. [42] also included the %Hrend in the final equations as well as age, height and BMI and explained 0.58 and 0.61 of the Australian women and men 6MWD's variability. Britto et al. [25] considered the ΔHr in the equation as well as age, sex and height and explained 0.62 of the Brazilian 6MWD's variability. The use of Hr data as a parameter included in the reference equation is controversial. The application of the %Hrend in the equation may be restricted when measuring the 6MWD in individuals with low fitness levels or with cardiac diseases or medications which have an impact on predicted maximum Hr or when signs such as dyspnoea or musculoskeletal pain limit test performance [42, 43]. However, according to Britto et al. [25] the ∆Hr use could in part neutralize this limitation. This may occur since these diseases and medications interfere not only in the end-walk Hr but also in the resting Hr, and thus their influence on the ∆Hr may be compensated and decreased [23, 25].

Resting diastolic-blood-pressure. In the Algerian study [23], although a resting diastolic-blood-pressure ≥ 100 mmHg was applied as a non-inclusion criteria, its values were negatively correlated with 6MWD in men and women, but not in the total sample (Table 4). The increase of the diastolic-blood-pressure by 10 mmHg decreases the 6MWD by 6.1 m and 6.2 m, respectively, in women and men [23]. To the best of authors' knowledge, among all studies aiming at establishing 6MWD norms in "healthy" adult subjects [2, 3, 18-48], the Algerian one was the first to report such findings. In patients with chronic respiratory conditions, such as obstructive-sleep-apnoea, arterial-hypertension was related to shorter 6MWD [17, 85]. Specific studies evaluating the relatioship between blood-pressures and 6MWD in patients with solely arterial-hypertenion are recommended.

Niqab-wearing effect. Only one study [22] looked for the effect of the niqab-wearing on the 6MWD. The authors investigated the effect of physical activity on a 6MWD among young adult niqab-wearing healthy Saudi women [22]. Women in the niqab-wearing group had a significantly longer 6MWD (n=20; mean±SD=510±82 m), than those in the niqab-nonwearing group (n=20; mean±SD= 371±63 m). Does this mean that submaximal exercise capacity for niqab-wearing women is better than the one of those who do not wear the niqab? Surprisingly, according to El-Sobkey et al. [22], the answer is "yes". More surprisingly, according to these authors [22], their result was rational because the niqab-wearing women were found to be physically more active than those who did not wear the niqab. The variation in the physical activity level between the two study groups was explained by the longer duration of walking practiced by the niqab-wearing group than by the niqab-nonwearing one [22]. The "positive" effect of niqab-wearing on 6MWD should be considered with a lot of doubt, since a previous study showed mean values of spirometry data including FVC, FEV1, FEV1/FVC ratio and the maximum-voluntary-ventilation for niqab-wearing women significantly lower than the values for niqab-nonwearing ones [86]. As the respiratory system has a vital role in determining a person's functional exercise capacity [87, 88] and as there is a significant reduction of ventilatory function with niqab-wearing [86], the functional exercise capacity of Saudi women wearing niqab should be altered.

Study limitation. The main limitation of the present review concerns the search for the "Arab world" in PubMed. PubMed has two challenges for those seeking literature on "Arab world" public health: as PubMed is mainly biomedical, there is no separate group for public health and there is no exact group for "Arab world" or "Arab countries". To confront the above difficulties, some authors [89] proposed a special strategy to capture literature focusing on public health in the region. The component of the search related to the 'Arab world' should include the combination of the following "Medical Subject Headings, MeSH" or "Title/Abstract, tiab" terms: «arabs» [MeSH] OR arab* [tiab] OR «middle east*»[tiab] OR «africa, northern»[MeSH] OR «north* Africa*»[tiab] OR «lebanon»[MeSH] OR leban*[tiab] OR syria*[tiab] OR iraq*[tiab] OR saud*[tiab] OR palestin*[tiab] OR gaza[tiab] OR «jordan»[MeSH] OR jordan*[tiab] OR bahrain*[tiab] OR egypt*[tiab] OR libya*[tiab] OR tunisia*/algeria*[tiab] OR yemen*/aden*[tiab] OR kuwait*[tiab] OR oman*[tiab] OR qatar*[tiab] OR «egypt»[MeSH] OR «morocco»[MeSH] OR sudan*[tiab] OR west-bank[tiab]. The use of the above-proposed terms does not modify the results of the present review.

Perspectives. Several other physiological factors can influence the 6MWD in healthy individuals and in patients with chronic conditions and thus, should be evaluated in future studies involving Arab populations. Among them some special factors should be highlighted, such as muscle strength, symptoms of depression, health-related quality-of-life impairment, cognitive deficit, medication use, arthritis and other musculoskeletal disorders, systemic inflammation and pulmonary function alterations [2-5]. Moreover, 6MWD can also be influenced by external factors, such as the effort spent and the motivation [49].

In conclusion, the 6MWD influencing factors in adult Arab populations are numerous and include some specific predictors such as parity, physical activity level and niqab-wearing.

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