القيم المرجعية التنفسية لأهالي مدينة صرمان الذين تتراوح أعمارهم بين(40 – 53) سنة

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ملخص البحث:

تعتبر القيم المرجعية الطبيعية لوظائف الرئة ذات أهمية قصوى لأنها تستخدم كمرجع للتعرف على القيم الغير طبيعية المتحصل علي قياسيا من نفس الفئة العمرية. حيث ينم مقارنة القيم المتحصل عليها قياسيا بالقيم المرجعية الطبيعية التي تم تحديدها مسبقا لنفس الفئة العمرية وبالتالي يمكن تقدير طبيعة درجة الخلل ، وحيث أنه لا توجد قيم مرجعية طبيعية لوظائف الرئة بمدينة صرمان ، وأن اختبار وظائف الرئة يعتمد على عدد من العوامل مثل الطول والعمر والجنس والعرق ؛ لذلك كان الهدف الرئيسي من هذه الدراسة هو إيجاد قيم مرجعية طبيعية لوظائف الرئة للأشخاص الليبيين الأصحاء والغير مدخنين الذين تتراوح أعمارهم مابين 40-53 سنة.

أجريت الدراسة في مدينة صرمان (حوالي 60 كم غرب مدينة طرابلس) لعدد 269 شخصا ليبيا وباستخدام جهاز قياس وظائف الرئة-(Vitalograph limited Spirometer Germany). تم قياس السعة القسرية (FVC) و الحجم الزفيرى في الثانية الأولى (FEV_1) ونسبة الحجم الزفيرى .(FEV_1%) وقد أظهرت نتائج الدراسة أن عاملي العمر والطول لهما تأثير قوى على قيم وظائف الرئة حيث أن قيم وظائف الرئة تقل مع تقدم العمر وبذلك فهي ترتبط ارتباطا سالبا مع العمر وتزيد بزيادة الطول ، وبذلك فأنها ترتبط ارتباطا موجبا مع الطول.

كما أظهرت نتائج الدراسة انخفاض في السعة القسرية والحجم الزفيرى عند مجموعة النساء مقارنة بمجموعة الرجال .

Pulmonary Function Reference Values in Libyan- Sormanians Aged 40-53 Years.

Introduction

Pulmonary function values (FVC,FEV_1 and FEV_1%) are known to vary with age, sex, height and race. (1,2).The influence of ethnic variation on pulmonary function has been the subject of many studies.(3,4).In routine testing, lung function values are measured in members of given communities and then compared with values derived from a population with a different ethnic background. However, failure to account for ethnic differences in lung function values could lead to errors in diagnosis and classification of impairment,(5,6).Therefore, normal reference lung function values should be established for every ethnic and age group. These reference values are used as standard to identify abnormal values derived from population with the same ethnic background . Consequently the nature and the degree of functional abnormality can be assessed.

Therefore, it is becoming mandatory to establish a normal range of spirometric reference values for every specific population.

Up-till now, there have been no reference values of pulmonary function for healthy Libyan adults aged between 40-53 years. Studies carried out in Libya were limited to age group 6-21years. (7,8). The Libyan study carried out in the city of Subrata was limited to the age group 20-40 years (9). Pulmonary function studies have been carried out in various populations in different parts of the world to establish reference values and formulae from which normal values can be predicted. (10,11,12). However these studies were performed in populations with different ethnic background. Consequently the reference values obtained from these studies are not applicable to the Libyan population.

To insure the validity of spirometric reference standard values it is important that the healthy subjects should be representative of the population from which patients will be derived. Since the Libyan studies limit only the age of 40 years, therefore, it is necessary to have normal pulmonary function data for Libyan adults beyond the age of 40 years to interpret accurately the pulmonary function changes in adulthood pulmonary diseases.

Due to the lack of information about lung function of aged male and female of Sorman people. We try to investigate the pulmonary function in order to determine of pulmonary function reference values (FVC and FEV_1) for healthy Libyan – Sormanians aged between 40-53 years.

Material and Methods.

The subjects included in this study were Libyan men and women aged 40 -53 years randomly selected from various schools Kuran schools and hospital employee, all located in Surman city (60 km west of Tripoli) .

The study group consisted of 269 subjects (131 males and 138 females) all healthy non smokers and received no medication . Immediately before undergoing the pulmonary function tests, a questionnaire was filled out during an interview concerning the their past medical history.

Physical Parameters such as standing height were obtained with a portable height and weighting scale (Seca Mod.220,max 150 kg).

The spirometric measurements (FVC, FEV_1, and FEV_1%) were obtained with a vitalograph spirometer (Vitalograph limited-Spirometer, Germany).

Respiratory measurements were performed in the morning (9:00 - 11:00 a.m).The procedures for the lung function test were explained individually to each person and three maneuvers were performed after adequate rest . Maneuvers were performed in the sitting position (without a nose clip) using disposable mouthpieces. The person `s lips were held tightly around the mouthpiece. The subject inhaled deeply, then exhaled as forcefully and rapidly as possible through the tubing while measurements were taken . The test was repeated two more times with a five minute interval between the two trials. These efforts were recorded and graphed on vitalogram charts. All values were automatically expressed to conditions of body temperature and pressure saturated with water vapor (BTPS units).

Statistical analysis :

Regression analysis were applied to each of the lung spirometric parameters, and for each sex separately. The linear regression was applied to assess the dependency of the lung function parameters on the variables age, height, and sex. The mean, and standard error were calculated. A value less than 0.05 was regarded to indicate statistical significance.

Results.

The total numbers of participants in this study was 269 (138 females and 131 males). Description of the study and the percentage of the groups are presented in table (1).

Table (1). Sample description

Sample	Frequency	%
Males	131	48.70
Females	138	51.30

Demographic characteristics:

The age range of all subjects in the present study was 40-53 years. The average age for males was 45.374 ± 0.346 years and for females was 45.971 ± 0.335 years. The average length of all subjects was (162 ± 0.51) cm . The average length of males was 168.4 ± 0.49 cm whereas , the average length of female was (155.8 ± 0.44) cm respectively.

The demographic parameters of males and females are presented in table (2).

Table (2). The demographic parameters of males and females.

Variable	Males n=131	Females n=138
	M ± SE	M ± SE
Age (in years)	45.374 ± 0.346	45.971 ± 0.335
Lenghtt (cm)	168.4 ± 0.49	155.8 ± 0.44

M = Mean. N = number of subjects. SE = Standard Error.

The males are taller than the age matched females.

Respiratory function variables:

The obtained lung function values (FVC, FEV_1) for males and females are presented in table (3).

Variable	Males n=131	Females n=138
	M ± SE	M ± SE
FVC in liter	3.90 ± 0.04	2.91± 0.03
FEV_1 in liter	3.24 ± 0.04	2.39± 0.03
FEV_1%	82.98 ± 0.45	82.44 ± 0.46

Table (3). Mean values with SE of FVC, FEV_1, and FEV_1% in males and females

The lung function parameters (FVC, FEV_1) were greater in males than females, but FEV_1% was similar in males and females.
Table (4). Presents, the mean values with SE of height , FVC , FEV_1 and FEV_1 % in the population sample (269 subjects).

n	**Lenght (cm)**	**FVC**	**FEV_1**	**FEV_1%**				
	Mean	**SE**	**Mean**	**SE**	**Mean**	**SE**	**Mean**	**SE**
269	**162.0**	**0.51**	**3.39**	**0.04**	**2.81**	**0.03**	**82.70**	**0.32**

Table (4). Mean . SE values of height , FVC , FEV_1 and FEV_1 % in the population sample.

Figure (1a), shows the linear relationship between age and FVC and FEV_1 for males, with their respective prediction equations. Statistically significant correlations (negative relationship) were found between age and FVC and FEV_1 at P=0.02 with FVC and P=0.01 with FEV_1. Figure (1b), shows the linear relationship between age and FVC and FEV_1 for females, with their respective prediction equations. Statistically significant correlations (negative relationship) were found between age and FVC and FEV_1 at P=0.00 with FVC and FEV_1. The linear relationship between age and FVC or FEV_1 decline with age in both sexes. Regression equations of relationship between age and FVC or FEV_1 in males are shown in table (5 a). Regression equations of relationship between age and FVC or FEV_1 in females are shown in table (5 b).

Figure (1a). Correlation of FVC, FEV_1 with age for males, with their respective prediction equations. $Y = b_0 + b_1 \times$

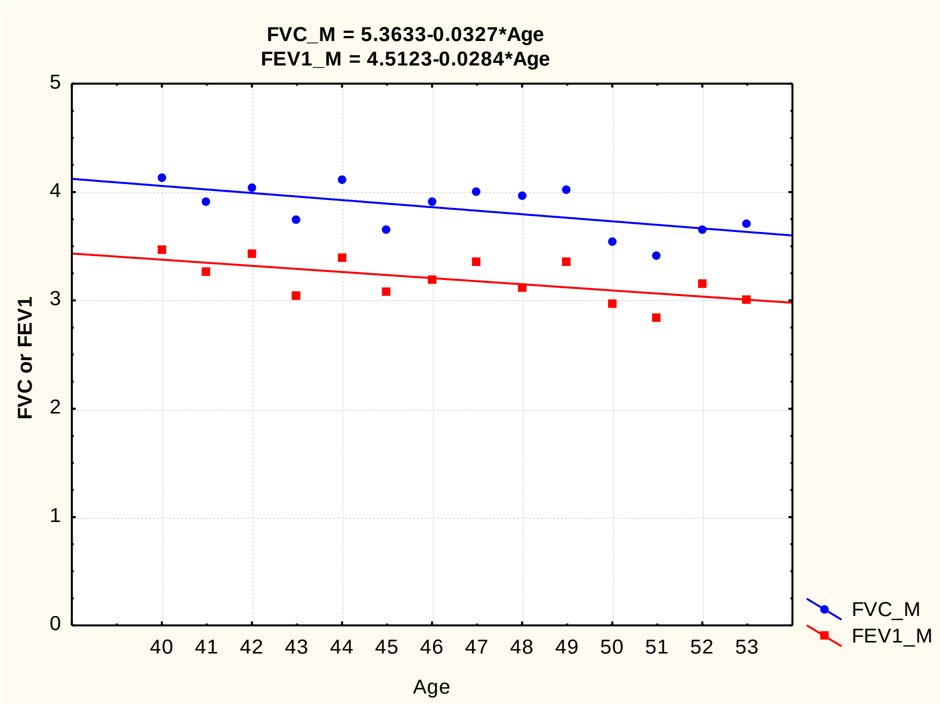

Table (5a). Regression equations of relationship between age and FVC or FEV_1 or FEV_1% in males .

D.v	Id.v	Constat	Slope	SE of Slope	t	P	R-Sq%
FVC	**Age**	**5.36**	**-0.033**	**0.012**	**-2.67**	**0.020**	**37.2**
FEV_1	**Age**	**4.51**	**-0.028**	**0.010**	**-2.73**	**0.018**	**38.4**
FEV_1 %	**Age**	**84.30**	**-0.026**	**0.134**	**-0.20**	**0.848**	**0.3**

Id.v= Independent variable. D.v= dependent variable

R-Sq% = coefficient of determination. t= Students t-test.

Figure (1b). Correlation of FVC, FEV_1 with age for females, with their respective prediction equations. $Y = b_0 + b_1 \times$

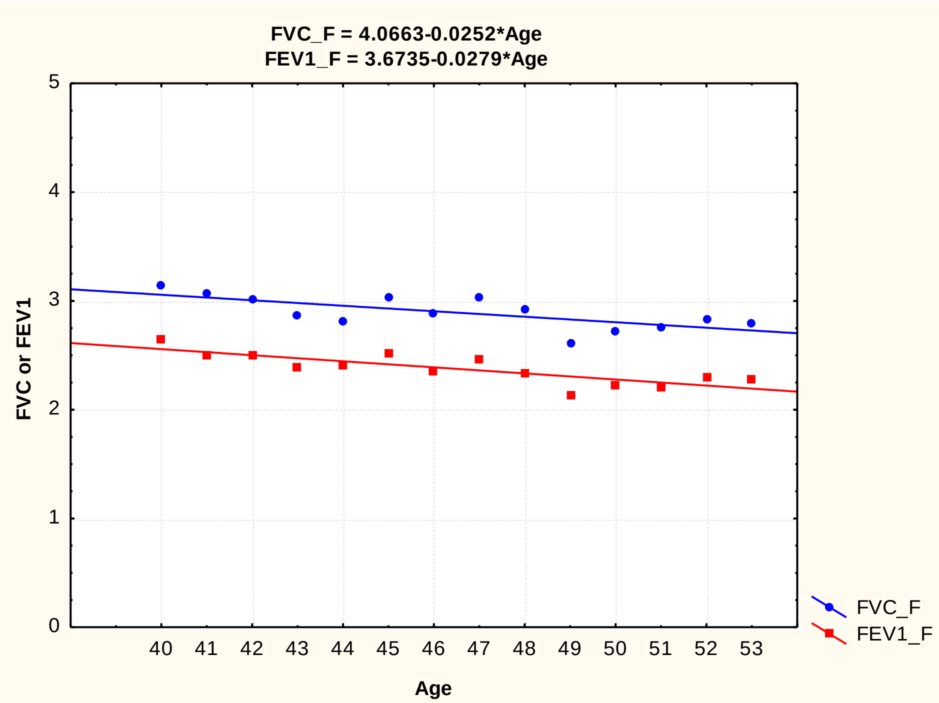

Table (5b). Regression equations of relationship between age and FVC or FEV_1 or FEV_1% in females .

D.v	Id.v	Constant	Slope	SE of Slope	t	P	R-Sq%
FVC	**Age**	**4.07**	**-0.025**	**0.007**	**-3.47**	**0.005**	**50.1**
FEV	**Age**	**3.67**	**-0.028**	**0.006**	**-4.83**	**0.000**	**66.0**
FEV_1 %	**Age**	**90.00**	**-0.166**	**0.082**	**-2.02**	**0.066**	**25.4**

Id.v= Independent variable. D.v= dependent variable

R-Sq% = coefficient of determination. t= Students t-test.

Figure (2a), shows the linear relationship between height and FVC or FEV_1 for males, with their respective prediction equations. Statistically significant correlations (positive relationship) were found between height and FVC and FEV_1 at P=0.000 with FVC and FEV_1. Regression equations of relationship between height and FVC or FEV_1 or FEV_1% for males are shown in table (6a). Figure 2b), shows the linear relationship between height and FVC and FEV_1 for females, with their respective prediction equations. Statistically significant correlations (positive relationship) were found between height and FVC and FEV_1 at P=0.000 with FVC and FEV_1.

Regression equations of relationship between age and FVC or FEV_1 in males are shown in table (6b).

Figure (2 a). Correlation of FVC, FEV_1 with height for males, with their respective prediction equations. $Y = b_0 + b_1 \times$

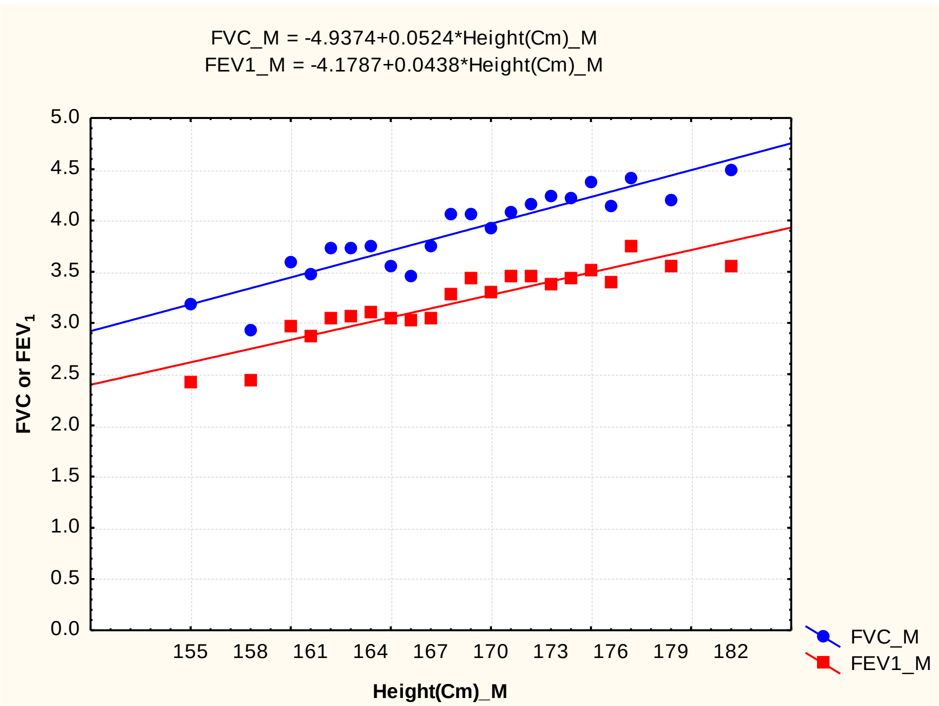

Table (6a). Regression equations of relationship between height and FVC or FEV_1 or FEV_1% in males.

D.v	Id. V	Constant	Slope	SE of Slope	t	P	R-Sq%
FVC	**Length (Cm)**	**-4.94**	**0.052**	**0.005**	**10.10**	**0.000**	**82.8**
FEV_1	**Length (Cm)**	**-4.18**	**0.044**	**0.004**	**10.09**	**0.000**	**82.8**
FEV_1 %	**Length (Cm)**	**76.98**	**0.033**	**0.074**	**0.45**	**0.659**	**1.0**

D.v= dependent variable Id.v= Independent variable.

t= Students t-test. R-Sq% = coefficient of determination.

Figure (2b).Correlation of FVC, FEV_1 with height for females, with their respective prediction equations. $Y = b_0 + b_1$

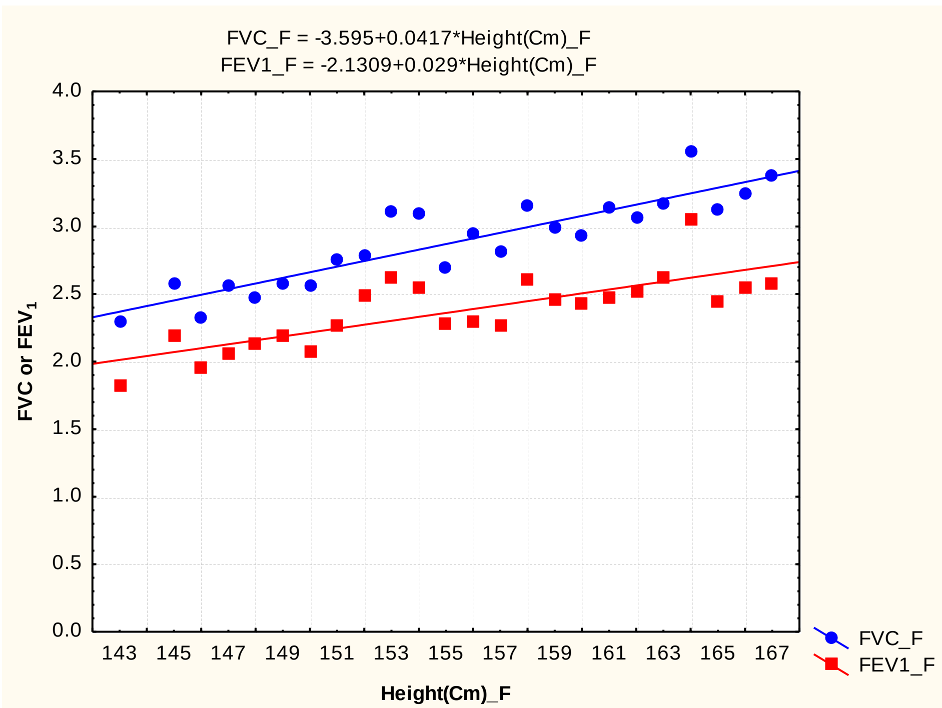

Table (6b). Regression equations of relationship between height and FVC or FEV_1 or FEV_1% in females.

D.v	Id. V	Constant	Slope	SE of Slope	t	P	R-Sq%
FVC	**Length (Cm)**	**-3.59**	**0.042**	**0.004**	**9.68**	**0.000**	**80.1**
FEV_1	**Length (Cm)**	**-2.13**	**0.029**	**0.005**	**5.85**	**0.000**	**59.1**
FEV_1 %	**Length (Cm)**	**105.12**	**-0.147**	**0.078**	**-1.88**	**0.073**	**10.0**

D.v= dependent variable. Id.v= Independent variable.

t= Students t-test. R-Sq% = coefficient of determination.

The prediction equations for Libyan Sormanians males and females aged 40-53 years are shown in table (7).

Table (7). Prediction equations for the spirometric parameters FVC ,FEV_1 of male and female subjects .

Variables	Regression equations
men (n = 131)	
FVC	**-0.342** + [**0.032**× **Length**] + (-**0.025**) × age
FEV_1	**0.201** + [**0.025** × **Length**] + (-**0.027**) × age
Women (n = 138)	
FVC	**-0.269** + [**0.027** × **Length**] + (**-0.023**) × age
FEV_1	**1.134** + [**0.016** × **Length**] + (-**0.027**) × age

Discussion

The objective of this study was to construct the spirometric reference equations for Libyan-Sormanians (residents of Sorman city) aged between 40-53 years. Appropriate spirometric reference values are vital for the assessment of lung function. The practice of functional testing dictates the qualification of the degree of functional impairment depending on the level of FEV_1 estimated as a percent of the reference value. Improper predicted values can delay the recognition of a developing illness or lead to inadequate rating of the observed impairment. Therefore this study was carried out to investigate the spirometric reference values in healthy Libyan-Sormanians aged between 40-53 years. This investigation determined the reference values (normal standard values) of forced vital capacity (FVC) and forced expiratory volume in one second (FEV_1). This investigation also determined the relationship between lung function parameters (FVC, FEV_1) and anthropometric factors (age and height) in both sexes. In pulmonary function studies, **Length** and age are considered to be good predicators of pulmonary function. besides height and age lung function profile is also affected by gender (sex). In other words, there are some differences between males and females concerning lung function parameters (spirometric values). The findings of this study revealed that the lung function parameters FVC and FEV_1 were greater in males than females. This is in agreement with the findings of several other studies. (13,14,15). The fact that FVC and FEV_1 are greater in males than females is explained by several means. First, the lateral and longitudinal dimensions of the thorax are greater in males than females. Second, males have larger lungs. Third, the strength of respiratory muscles is greater in males than females. All these variables combined lead us to expect that males normally would elicit a greater response than females. In other words, the lung function parameters (FVC and FEV_1) are expected to be, and they are larger in males than females. (16,17).

This study demonstrated a significant correlation (negative relationship) between age increment and FVC and FEV_1 in both males and females. The decline in FVC and FEV_1 in elderly subjects is in agreement with the study of Gloshan *et al*. (18) who reported that FVC and FEV_1 decreased gradually with age increment, but the precise rate of decline depended on the interrelationship between age and **Length**. The fact that spirometric indices (FVC and FEV_1) decline after the age of 20-25 is verified by several other studies.(19,20,21,22). It is well known that a reduction in the strength of respiratory muscles, and an increase in stiffness of the thoracic cage are products of aging. In other words, aging causes a progressive loss of alveolar elastic recoil, calcification of costal cartilage, a reduction in the space between the spinal vertebrae, and a greater degree of spinal curvature. All these changes combined lead to a decrease in chest wall compliance resulting in a progressive and gradual fall in the spirometric values (FVC and FEV_1). Since the performance of a satisfactory lung function test depends upon a proper functioning chest cage and normal elasticity of the lungs, one would anticipate a decline in the lung function parameters (FVC and FEV_1) with age increment and this is consistent with the results reported by this study.

As stated earlier height is considered to be a good predictor of pulmonary function. This investigation showed statistically significant correlations (positive relationship) between **Length** and FVC and FEV_1 in both males and females. The association between lung function parameters (FVC and FEV_1) and **Length** found in this study is consistent with the results reported by other studies carried out in different parts of the world. All these previous studies reported an increase in FVC and FEV_1 with **Length** in both sexes (23,24). The positive correlation between height and increment in

FVC and FEV_1 is explained by the reasoning that taller people have larger lung volumes (25).

It is crucial to remember the importance of using reference (prediction) equations appropriate to the ethnicity, age, and **Length** characteristics of the population to whom inferences are to be applied.

Conclusion

It is concluded that the standard reference equations for pulmonary function tests for the Libyan population of Sorman. In other words, the results obtained from the study should be applicable to the Libyan population of sorman (males and females) and provided that they are of similar age and length.

The study so far provides the standard predicted values, against which measured values obtained from patients of similar gender, age and lenght should be compared. Therefore, the reference equations derived in the study may be helpful clinically to diagnose of some respiratory disorders. It is concluded that the final results can be also applicable on Libyan population for long termes.

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