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Health risk factors for the development of decompression sickness among U.S. Navy divers

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Dembert ML, Jekel JF, Mooney LW. Health risk factors for the development of decompression sickness among U.S. Navy divers. Undersea Biomed Res 1984; 11(4):395–406.—The relationship between the health status and physical characteristics of 185 U.S. Navy divers and their risk for experiencing decompression sickness was examined utilizing historical cohort design. Data on multiphasic medical examinations performed on these men between 1972–1978 were obtained. Cases of decompression sickness before and after examination were identified. Divers who did experience decompression sickness either before or after examination had significantly higher measures of skinfold thickness and weight when compared to those who remained free of decompression sickness. Those divers in the highest quartile of each of the three significant skinfold thicknesses measured had risks for decompression sickness that were generally 9 to 10 times as great as those calculated for the combined lower 3 quartiles and 5 to 6 times as great as the average crude risk calculated for all Navy divers over the past 5 yr. These findings suggest that obesity may be a contributory factor to the occurrence of decompression sickness.

cohort	obesity
decompression sickness	risk factor
skinfold thickness	relative risk

Decompression sickness is a relatively uncommon entity among U.S Navy divers. For example, among 92,484 dives made in the Navy in 1981, 35 dives, or approximately 38/100,000, were associated with decompression sickness (1). Mortality from decompression sickness is infrequent, and associated morbidity can be effectively treated with the appropriate use of hyperbaric oxygen and adjunctive drug therapy. Nevertheless, the successful treatment of a case of decompression sickness can require significant outlays of personnel, resources, and time. Furthermore, as diving technology enables man to dive deeper and for longer periods of time, the consequences of decompression sickness become more serious.

The prevention of decompression sickness among divers has historically been concerned with adherance to strict diving and decompression protocols, improving equipment and training, and better defining suitable environmental conditions above and below the water surface. Relatively little importance has been placed on the relationship between a diver's health status and physical characteristics and his risk for experiencing decompression sickness. Past investigations (2–5) have suggested that age, weight, type of body build, and amounts of subcutaneous fat are important factors in this relationship. However, the interpretation of these results is limited. The cross-sectional and case-control designs used identified associations, but these designs do not allow for definite cause-effect relationships to be determined from the data. Moreover, the relation of decompression sickness to other endogenous health factors or health practices was not investigated.

The identification of individual health risk factors associated with the occurrence of a disease is important in that effective screening programs for acquisition of that disease can be implemented (6). Therefore, the present work, utilizing a historical cohort study design, was undertaken to examine the relation of various health parameters with the subsequent first-time occurrence of decompression sickness among a group of U.S. Navy divers. By following a group of individuals (cohort) over time and observing which ones experience the outcome of interest, this type of study design allows for the estimation of relative risk for decompression sickness based on significant medical examination variables. Another important objective of this study was to examine parameters that can be obtained routinely at the diving medical examination. This would allow the examiner to assess their relative significance in estimating the candidate's physical fitness for low-risk diving.

METHODS

Initial examination

From June 1972 until February 1978, the Naval Submarine Medical Research Laboratory, Naval Submarine Base, Groton, CT, conducted the initial phase of a prolonged longitudinal health survey of Navy divers. The purpose, design, and methodology of this survey are described elsewhere (7–9).

Two hundred divers were initially entered into this project. At entry, each diver received a complete muliphasic medical examination. Areas of examination included: naval and diving background; medical history; physical examination; selected anthropometry; audiometry; psychological testing (Minnesota Multiphasic Personality Inventory); blood chemistry and hematology; pulmonary function tests; electrocardiography; roentgenography; and vision testing. The findings of the initial examinations on the 200 divers have been reported elsewhere (9–10). Subsequent followup examinations have not been performed.

The present project incorporated those variables that intuitively could have a causal association with the occurrence of decompression sickness. These included 51 indices of anthropometric, biochemical, hematological, cardiovascular, and pulmonary status, as well as reported levels of smoking, alcohol, and coffee consumption (Table 1). Estimates of diving exposure were also computed and are discussed later. A prior history of decompression sickness was reported as a yes-no response at the initial examination.

Diving history

Since 1971, the OPNAV 9940/1 Form Diving Log has been used to record any dive made by a Navy diver. This form is completed by the diver or his diving supervisor. It includes identifying information, dive depth and bottom time, decompression schedule characteristics, environmental conditions, equipment used, breathing gas mixture, and a description of any injuries or medical problems that occurred during or after the dive. This completed form is

TABLE 1

SELECTED MULTIPHASIC HEALTH EXAMINATION INDICES OBTAINED ON A STUDY POPULATION OF 185 U.S. NAVY DIVERS

Naval and diving background
Pay grade
Previous years of diving
Previous history of decompression sickness
Medical history
Age at examination
History of allergy
Cigarette consumption (status; packs per day; years smoking; pack years)
Cigar/pipe consumption (status; number per day; years smoking)
Alcohol consumption (status; drinks per week; years drinking)
Coffee consumption (status; cups per day; years drinking)
Anthropometry
Height
Weight
Quetelet's index (weight/height^2)
Chest depth
Chest breadth
Chest circumference
Bideltoid width
Triceps skinfold
Triceps + subscapular skinfolds
Triceps + subscapular + abdominal skinfolds
Triceps + subscapular + suprailiac skinfolds
Triceps + subscapular + abdominal + suprailiac skinfolds
Biochemistry (blood)
Fasting glucose
Two hour postprandial glucose
Cholesterol
Uric acid
Lactic dehydrogenase
Alkaline phosphatase
Glutamic oxaloacetic transaminase
Total bilirubin
Calcium
Phosphate
Total protein
Albumin
Blood urea nitrogen
Hematology
Hemoglobin
Hematocrit
Blood pressure
Systolic
Diastolic
Pulse rate
Pulmonary function
Percent of predicted FEV_1*
Percent of predicted FVC*
Percent of predicted FEV_1/FVC*

*Calculated by: (Observed/Predicted) × 100, with predicted values obtained by use of prediction equations derived by Schoenberg et al. (11); FEV_1 = forced expiratory volume in 1 s; FVC = forced vital capacity.

then sent to the U.S. Naval Safety Center, Norfolk, VA, where it is entered into the computer data bank.

For each of the 200 divers, a search was made for the occurrence of any case of decompression sickness from the date of examination up to and including 31 December 1981. Relevant characteristics of the identified cases are presented in Table 2.

Next, a listing of the diving exposure history for each of the participating divers was obtained. This included diving activities from the day after the initial examination until one of three dates: a) the date of decompression sickness; b) 31 December 1981, if he remained on active diving duty until the study termination date; or c) the date of last recorded dive, if he ceased naval diving before 31 December 1981. For each diver, this listing gave a brief description of each dive that he made during the appropriate time period, including the date, the depth of dive, and the bottom time.

For every man, each dive was categorized into 1 of 12 depth-bottom time combinations (Table 3). These categories have been formulated previously to allow for an assessment of the types of diving done by Navy divers (12). The number of dives in each category, as well as the total for the 12 categories, was computed. To obtain adjusted measures of exposure, the number of dives per category was divided by the individual length of postexamination diving time in months to give an estimate of the dive rate (dives/month) per category.

Analysis of data

Comparisons of variables were made among three groups of the cohort. These were: 1) divers who reported no history of preexamination decompression sickness and did not experience decompression sickness while in the study (noDCS); 2) divers who reported no history of preexamination decompression sickness but did experience decompression sickness for the first time while in the study (DCS); and 3) divers who reported a previous occurrence of decompression sickness but did not experience decompression sickness while in the study (preDCS).

TABLE 2

CHARACTERISTICS OF 12 CASES OF FIRST-TIME DECOMPRESSION SICKNESS OBSERVED AMONG 169 U.S. NAVY DIVERS RETROSPECTIVELY FOLLOWED DURING 1972–1981.

Diver	Breathing Gas	Decompression Schedule Depth/PP	Decompression Schedule Bottom time (min)	Manifestations	Type DCS
J.C.	Air	165	2,261	Left elbow pain	1
S.W.	Air	180	20	Left shoulder pain	1
C.S.	He O_2	1,400	18,720	Vestibular dizziness	2
J.J.	Air	130	70	Right shoulder pain	1
T.K.	Air	130	70	Dizziness	2
L.W.	Air	120	10	Left arm numbness	2
D.B.	Air	60	1,000	Right knee pain	1
D.G.	He O_2	290	10	Low back pain	1
P.B.	Air	120	50	Right leg pain	1
R.P.	Air	160	15	Left leg weakness	2
D.S.	Air	60	6,457	Right leg pain	1
E.S.	He O_2	238	40	Left knee pain	1

TABLE 3
CATEGORIES OF DIVING EXPOSURE FOR U.S. NAVY DIVERS, BASED ON DEPTH-BOTTOM TIME COMBINATIONS*

Category	Depth, ft	Bottom Time, min	Bottom Time, h
Shallow-short (SS)	<100	<30	—
Shallow-medium (SM)	<100	30–60	—
Shallow-long (SL)	<100	>60	—
Medium-short (MS)	100–200	<30	—
Medium-medium (MM)	100–200	30–60	—
Medium-long (ML)	100–200	>60	—
Deep-short (DS)	201–300	<30	—
Deep-medium (DM)	201–300	30–60	—
Deep-long (DL)	201–300	>60	—
Sub-saturation (BS)	<300	—	<12 h
Shallow-saturation (WS)	<300	—	>12 h
Deep-saturation (PS)	>300	—	>12 h

*Berghage et al. (12).

Continuous variables were compared by difference between the means, and categorical variables were analyzed by chi square tests. Risks for experiencing decompression sickness were calculated as follows. Frequency distributions were obtained for selected health factor variables whose means were significantly different between the DCS and noDCS group. The distributions were divided into quartiles. The total number of dives made by divers within each quartile was calculated. Within each quartile, the number of dives resulting in decompression sickness was divided by the total dives in that quartile to obtain the risk of decompression sickness on a per dive basis (or expressed in integers as risk per 100,000 dives). Tests for linear trend in proportions (13) were performed on these risk estimates. For all data analysis, the minimal level for statistical significance was set at $P = 0.05$.

Assumptions of study design

The present investigation used strategies that are employed in epidemiologic studies of cohorts (14–16) where a binary outcome (the disease does or does not occur for the first time) is the event of interest. Several assumptions based on these strategies were made in the design of this study on decompression sickness.

First, levels of health risk factors measured at initial examination were assumed to remain constant throughout each man's followup period. Second, the first-time occurrence of decompression sickness was sought as the event of interest. Decompression sickness before examination, or occurring more than once in an individual during the study period, may independently affect health risk factors and thus influence the risk for its subsequent occurrence. Third, the first-time occurrence of decompression sickness during followup removed the diver from the rest of the study period and entered him into the analysis. The removal of a case from the rest of the study period gives an "artificially" shortened followup time and can give biased results on statistical testing when time-dependent factors such as the number of dives done (per category or total) is compared between cases and noncases. Thus, a measure of diving activity adjusted for time, e.g., dives per month, was chosen as an appropriate factor of diving exposure.

Fourth, specific decompression schedules and other dive factors occurring at the actual event of a case of decompression sickness were not considered for statistical analysis. These specific extrinsic factors may have predisposed the diver to experiencing decompression sickness (much as sudden and prolonged exercise may lead to myocardial infarction) but they were not considered chronic implicit risk factors.

Finally, the purpose of the analysis was to establish relative risks for decompression sickness based on health factors and not to compare incidence rates of decompression sickness.

RESULTS

Data on a total of 200 male divers were initially considered for analysis. Fifteen divers were subsequently excluded when it was found that either they did not continue to dive after their initial physical examination [13] or historical information on prior decompression sickness was not recorded at initial examination [2]. Therefore, statistical analyses were performed on a total cohort of 185 divers, all of whom were alive at their respective study endpoint dates. The distribution of these divers among the three groups of the cohort was as follows: 157 noDCS, 12 DCS, and 16 preDCS. None of the 12 DCS divers experienced more than one episode of decompression sickness during the study period. The distribution of the 12 DCS dives and total dives done by the cohort of 169 divers with no previous decompression sickness, categorized by the 12 depth-bottom time combinations, was: SS 0/3834; SM 0/4785; SL 0/3891; MS 3/1615; MM 2/94; ML 1/49; DS 1/69; DM 1/6; DL 0/6; BS 0/2; WS 3/44; and PS 1/14.

Eight cases of Type 1 and four cases of Type 2 decompression sickness occurred among the 12 DCS divers. Because of the relatively small number of DCS divers available among this cohort, we chose to test a hypothesis based on decompression sickness in general. For all subsequent analyses, the cases of both types were combined into one cohort, for two reasons. First, it is recognized that the two types are clinically different (17), yet several hematologic and extravascular processes may be fundamental and operative in the etiology of both Types (18–19). Second, separately analyzing two smaller cohorts of eight and four would diminish the ability to detect statistically significant differences between cases and noncases and tend to obscure any true associations between specific risk factors and decompression sickness.

Of major interest was the comparison between the noDCS and DCS groups. However, it was also felt important to compare the preDCS and the DCS groups. Similar patterns between the two decompression sickness groups would strengthen the hypothesis that divers who experience decompression sickness differ in certain physiologic/anthropometric/biochemical parameters from those who do not experience decompression sickness.

Comparison of DCS and noDCS groups

At the initial examination (entrance into the study), no significant differences in age, total years of previous diving, or distribution by military pay grade existed between the two groups.

Table 4 lists the mean values for those examination variables that were significantly different between the two groups. A conceptually important pattern emerged from this group of variables. Divers who developed decompression sickness had higher values for certain physical characteristics associated with increased body fatness or obesity (20–24). These characteristics included: sum of triceps-subscapular-abdominal skinfolds ($P = 0.025$); sum of triceps-subscapular-suprailiac skinfolds ($P = 0.031$); sum of triceps-subscapular-suprailiac-abdominal skinfolds ($P = 0.021$); weight ($P = 0.040$); serum cholesterol ($P = 0.015$); and waist circumference ($P = 0.008$). Additionally, differences in triceps and triceps-subscapular skinfolds were near statistical significance ($P = 0.068$ and $P = 0.089$, respectively).

No significant differences for height or Quetelet's index were found. However, differences existed for mean values of chest circumference ($P = 0.017$) and chest depth ($P = 0.021$), which were higher in the DCS group. Mean concentrations of serum phosphate ($P = 0.004$) and blood urea nitrogen ($P = 0.047$) were higher in the noDCS group.

The two groups showed no differences on percent predicted pulmonary function values. Nine of the 12 DCS divers and 78 of the 157 noDCS divers were current smokers. However, only three of the nine DCS divers who smoked had undergone pulmonary function testing, so

TABLE 4

MEAN VALUES FOR EXAMINATION VARIABLES FOUND TO BE SIGNIFICANTLY DIFFERENT WHEN 16 U.S. NAVY DIVERS WHO EXPERIENCED DECOMPRESSION SICKNESS BEFORE INITIAL EXAMINATION (preDCS) AND 12 U.S. NAVY DIVERS WHO EXPERIENCED FIRST-TIME DECOMPRESSION SICKNESS DURING FOLLOWUP (DCS) WERE SEPARATELY COMPARED TO 157 U.S. NAVY DIVERS WHO REMAINED FREE OF DECOMPRESSION SICKNESS BEFORE EXAMINATION AND DURING FOLLOWUP (noDCS)

	preDCS	noDCS	DCS
Anthropometric			
Weight (kg)	83.86	80.77	86.82*
Chest depth (cm)	25.5	24.7	26.1*
Chest circumference (cm)	102.1	99.5	103.7*
Waist circumference (cm)	91.7	87.9	94.6*
Triceps skinfold (mm)	21.5*	16.9	21.5
Subscapular skinfold (mm)	24.8*	19.1	24.0
Abdominal skinfold (mm)	31.4*	23.5	34.0*
Suprailiac skinfold (mm)	29.9*	23.3	32.1*
Triceps + subscapular skinfolds (mm)	46.3*	36.0	45.5
Triceps + subscapular + abdominal skinfolds (mm)	77.7*	59.5	79.5*
Triceps + subscapular + suprailiac skinfolds (mm)	76.2*	59.3	77.6*
Triceps + subscapular + suprailiac + abdominal skinfolds (mm)	107.6*	82.8	111.6*
Percent body fat	20.3	17.9	21.4*
Biochemistry			
Phosphate (mg/dl)	3.7	3.6	3.0*
BUN (mg/dl)	14.6	16.2	13.7*
Cholesterol (mg/dl)	203.5	203.6	234.3*

*$P < 0.05$.

that sufficient numbers did not exist to compare pulmonary function values of smokers who did or did not develop decompression sickness.

No significant differences were observed in the reported consumption of cigarettes, alcohol, coffee, and cigars/pipes.

No significant difference in diving exposure rate, either combined or in any of the 12 categories, existed between the two groups.

Comparison of preDCS and DCS groups

Only three variables on which the preDCS and DCS groups differed significantly were identified. The preDCS divers had proportionately more men of higher rates/ranks; the serum phosphate was higher (although within normal limits) in the preDCS group; and the preDCS divers were comprised of more men who were ex-smokers or who never smoked. Notably, dive rates were not significantly different between the two groups for the combined rate or for 10 of the 12 categories. There were no dives performed in the deep-long or subsaturation categories for either group.

Estimation of risks for decompression sickness

Compared to weight, serum cholesterol, or waist circumference, skinfold thickness is the most acceptable method for predicting body fatness (25). Therefore, the risk of developing decompression sickness per subsequent dive was calculated for each quartile within the three significant skinfold indices (Table 5). All of them evidenced a significant positive linear trend to the risks, going from lowest to highest quartile of thickness. These risks were compared to the crude risk/dive calculated from data from all Navy dives in the years 1977–1981. Generally, risks in the lowest three quartiles for all indices were of a magnitude comparable to the average annual Navy-wide risk of 45/100,000 (average annual number of DCS cases/average annual total number of dives = 35/78,448 = 0.00045). However, risks at the highest quartile were five to six times as high as the Navy-wide risk.

For each skinfold index, the relative risk, or risk ratio, was computed by comparing the highest quartile risk with that obtained by combining cases and total dives for the lower three quartiles (Table 6.). Risks calculated from combining the lower three quartiles were of the same magnitude as the all-Navy risk. When the top quartile was compared to the lower three quartiles, the relative risk ranged from 8.7 to 9.8. Again, from a clinical standpoint, risks for experiencing decompression sickness became marked when subcutaneous fat reached a demonstrably high level as measured by the skinfold technique.

DISCUSSION

In this investigation, divers with larger amounts of subcutaneous fat had a higher risk for experiencing decompression sickness. Specifically, this increased fatness was seen mainly in lower truncal skinfolds, and less from the chest and arm. Furthermore, when compared to other groups of men, this cohort of divers had mean levels of subcutaneous fat (triceps, subscapular, abdominal, suprailiac) that were higher than those reported on study populations of U.S. Marine Corps personnel (23), Olympic swimmers (26), and college men (27).

Other variables less predictive of obesity were also found to be associated with the occurrence of decompression sickness. The high mean serum cholesterol value for the DCS group

TABLE 5

PER DIVE RISK FOR EXPERIENCING DECOMPRESSION SICKNESS AMONG 185 U.S. NAVY DIVERS, BASED ON QUARTILE-SPECIFIC CATEGORIES OF SKINFOLD THICKNESSES

	Quartile			
Skinfold Thickness	25%	50%	75%	100%
Triceps + subscapular + abdominal				
Range of values	18–38 mm	39–53 mm	54–79 mm	80–130 mm
Cases/total dives*	2/6445	1/2671	0/2437	7/2840
Risk/dive	31/100,000	37/100,000	0/100,000	246/100,000 ($P = 0.007$)**
Triceps + subscapular + suprailiac				
Range of values	18–38 mm	39–54 mm	55–86 mm	87–114 mm
Cases/total dives*	1/6622	2/2862	1/2477	6/2432
Risk/dive	15/100,000	70/100,000	40/100,000	288/100,000 ($P = 0.004$)**
Triceps + subscapular + abdominal + suprailiac				
Range of values	25–50 mm	51–73 mm	74–117 mm	118–172 mm
Cases/total dives*	1/6437	2/3026	0/2198	7/2732
Risk/dive	16/100,000	66/100,000	0/100,000	256/100,000 ($P = 0.003$)**

*Only 10 of the 12 DCS divers had skinfold thickness measurements done at initial examination. **Test for linear trend in proportions.

is of clinical concern as a risk factor for cardiovascular disease. Moreover, elevated cholesterol values are associated with increased body fatness (24, 28). However, in the present work, dietary histories were not obtained and serum cholesterol therefore cannot be considered an accurate predictive risk factor for decompression sickness.

The higher chest circumference and chest depth measurements among the DCS group intuitively suggest larger thoracic cages. However, there were no significant differences on bideltoid width, height, or Quetelet's index [a measure of body mass calculated from the ratio of weight divided by the square of height (23)]. This suggests that the men in the two groups were of comparable body frames. Moreover, larger amounts of upper truncal subcutaneous fat, as suggested by the subscapular skinfold findings, probably contributed toward the increased chest circumferences.

Two other significantly different biochemical variables (serum phosphate, blood urea nitrogen) were within established normal ranges and their relevance to the outcome is considered minimal.

The pattern of obesity among the divers in this study who developed decompression sickness could not be explained by differences in age, total years of prior diving, or distribution by pay grade. Moreover, alternative explanations for these findings based on measures of diving activity and health practice (consumption of cigarettes, cigars/pipes, alcohol, and coffee) were not significantly different between the two groups.

The divers who experienced decompression sickness before their entrance into the study showed a pattern of obesity similar to those who had decompression sickness during the study.

TABLE 6

RELATIVE RISK FOR EXPERIENCING DECOMPRESSION SICKNESS AMONG 185 U.S. NAVY DIVERS, BASED ON QUARTILE-SPECIFIC CATEGORIES OF SKINFOLD THICKNESSES AND COMPARING THE FOURTH QUARTILE RISK WITH THE COMBINED RISK FROM THE FIRST THREE QUARTILES

Skinfold Thickness	Combined 1st/2nd/3rd Quartiles	4th Quartile	Relative Risk
Triceps + subscapular + abdominal			
Range of values	18–79 mm	80–130 mm	
Cases/total dives*	3/11553	7/2840	
Risk/dive	26/100,000	246/100,000	9.5
Triceps + subscapular + suprailiac			
Range of values	18–86 mm	87–114 mm	
Cases/total dives*	4/11961	6/2432	
Risk/dive	33/100,000	288/100,000	8.7
Triceps + subscapular + abdominal + suprailiac			
Range of values	25–117 mm	118–172 mm	
Cases/total dives*	3/11661	7/2732	
Risk/dive	26/100,000	256/100,000	9.8

*Only 10 of the 12 DCS divers were measured for skinfold thickness at initial examination.

There were proportionately more men in higher pay grades among the preDCS group. As the two groups did not differ on age at examination or previous years of diving, this finding may reflect self-selection bias among higher pay grades for participating in medical examinations that give a complete assessment of overall health. An explanation for the smaller proportion of current smokers among the preDCS group may be that men who experienced decompression sickness were sufficiently concerned about their health afterward to stop smoking cigarettes. More important, the two groups did not differ on rates of diving. Thus, the occurrence of previous decompression sickness did not effect an obvious subsequent change in the frequency of dives made.

Anecdotes and "sea stories" among the diving community relate that obese men are more prone to decompression sickness. These contentions have been somewhat substantiated in published research. Smith in 1873 noted that obese tunnel workers suffered a higher incidence of caisson disease than did their lean counterparts (29). Compressed-air tunnel workers who had experienced decompression sickness were found to have higher amounts of subcutaneous fat in triceps and subscapular skinfolds; moreover, a correlation was noted between the amount of fat and the number of cases of decompression sickness per man (5). A case-control study of Japanese divers (30) found that obese divers were more likely to have experienced decompression sickness than slender divers. The results of the present work similarly implicate obesity. All of these findings are biologically plausible if the long-held concept of adipose tissue's important role in the uptake and release of inert gas in the body is considered (31).

Strategies to the design of this work can be modified in future observational studies of divers. First, histories on other chronic occupational exposures (e.g., welders, enginemen, hull technicians, and painters), which can independently affect health and possible disposition to decompression sickness, were not incorporated into the initial examination. Second, although the emphasis was placed on endogenous health factors, the number of dives per month was empirically felt to be the best adjusted measure of diving exposure for the purposes of comparison among the diver groups. Third, associations between measures of obesity and other aspects of diving operations/exposure (e.g., decompression schedule, type of diving done, breathing gas mixture, equipment used, climatic and water conditions) and their contribution to decompression sickness were not able to be examined. Many of these aspects have numerous categories; therefore, proper analysis would require extensive stratification (for cross-tabulation) of data on a much larger cohort and number of cases. Also, a study design which allowed for multiple cases of decompression sickness (nonremoval of cases) among individuals during followup would be necessary.

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Dembert ML, Jekel JF, Mooney LW. Facteurs de risques à la santé dans le développement de la maladie de décompression parmi les plongeurs de la Marine Américaine. Undersea Biomed Res 1984; 11(4):395–406. La relation entre l'état de santé et les caractéristiques physiques de 185 plongeurs de la Marine américaine et leur chance de souffrir de la maladie de décompression furent examinées en utilisant le modèle d'ordre historique. L'information fut obtenue des examens médicaux multiphasiques effectués chez ces hommes entre 1972–1978. Les cas de maladie de décompression avant et après l'examen furent identifiés. Les mesures pour l'épaisseur du plis cutané et du poids corporel étaient significativement plus élévées chez les plongeurs qui subirent une maladie de décompression soit avant ou après l'examen, comparativement à ceux qui ne furent pas atteint de la maladie de décompression. Les plongeurs appartenant au quartile supérieur pour chacune des 3 épaisseurs représentatives du plis cutané mesuré présentaient des risques de maladie de décompression qui étaient généralement de 9 à 10 fois plus grands que ceux calculés pour les 3 quartiles inférieurs combinés et de 5 à 6 fois plus élevés que le risque moyen grossier calculé pour l'ensemble des plongeurs de la Marine au cours des 5 dernières années. Ces résultats suggèrent que l'obésité pourrait être un facteur contributif au développement de la maladie de décompression.

ordre — obésité
maladie de décompression — facteur de risque
épaisseur du plis cutané — risque relatif

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