A survey on the health status of Dutch scuba diving instructors

Prashant Komdeur[1], Thijs T Wingelaar[2,3], Rob A van Hulst[3]

[1] *Sports Medical Center Papendal, Hengstdal 3, 6574 NA Ubbergen, the Netherlands*
[2] *Diving Medical Center, Royal Netherlands Navy, Den Helder, the Netherlands*
[3] *Department of Anaesthesiology, University Medical Center, Amsterdam, the Netherlands*

Corresponding author: *Dr Prashant Komdeur, Sports Medical Center Papendal, Hengstdal 3, 6574 NA Ubbergen, the Netherlands*
p.komdeur@smcp.nl

Key words
Age; Drugs; Fitness to dive; Health surveys; Medications; Medical conditions and problems; Risk factors

Abstract
(Komdeur P, Wingelaar TT, van Hulst RA. A survey on the health status of Dutch scuba diving instructors. Diving and Hyperbaric Medicine. 2021 March 31;51(1):18–24. doi: 10.28920/dhm51.1.18-24. PMID: 33761537.)
Introduction: As the diving population is ageing, so are the diving instructors. Health issues and the use of prescribed medications are more common when ageing. The death of two diving instructors during one weekend in 2017 in the Netherlands, most likely due to cardiovascular disease, motivated investigation of the prevalence of relevant comorbidities in Dutch diving instructors.
Methods: All Dutch Underwater Federation diving instructors were invited to complete an online questionnaire. Questions addressed diving experience and current and past medical history including the use of medications.
Results: A response rate of 27% yielded 497 questionnaires (87% male, average age 57.3 years [SD 8.5]). Older instructors were over-represented among responders (82% of males and 75% of females > 50 years versus 66% of males and 51% of females among the invited cohort). Forty-six percent of respondents reported no current medical condition. Hypertension was the most commonly reported condition followed by hay fever and problems equalising ears and sinuses. Thirty-two percent reported no past medical condition. Problems of equalising ears and sinuses was the most common past medical condition, followed by hypertension, joint problems or surgery, and hay fever. Fifty-nine percent used non-prescription medication; predominantly analgesics and nose or ear drops. Forty-nine percent used prescription medicine, mostly cardiovascular and respiratory drugs. Body mass index (BMI) was > 25 $kg \cdot m^{-2}$ in 66% of males and 38% of females. All instructors with any type of cardiovascular disease were overweight.
Conclusions: Nineteen percent of responding diving instructors suffered from cardiovascular disease with above-normal BMI and almost 60% used prescribed or non-prescribed medication. Some dived while suffering from medical issues or taking medications, which could lead to medical problems during emergency situations with their students.

Introduction

In 2017, during one weekend, three experienced Dutch scuba divers (two diving instructors), all of them over 60, died during their dive. Two of them were taking medication for cardiovascular disease, so the cause of death was considered to be cardiac. These events motivated us to investigate the prevalence of relevant comorbidity in Dutch diving instructors.

The scuba diving community is ageing.[1,2] In general medicine, the ageing population shows an increase in co-existing medical conditions, whether recognised or not.[3] Studies show that experienced recreational scuba divers continue to dive despite medical contraindications.[2,4] Older scuba divers are overrepresented in fatality reports, and co-existing medical conditions are one of the factors.[5] The DAN Annual Diving Report has shown that most fatalities occur between the ages of 50–59 in US divers and it is hypothesised that cardiovascular disease is a major factor.[6,7] There are currently recommendations for the medical (cardiovascular) fitness of recreational divers; however, there are no specific recommendations for diving instructors.[8] In the Netherlands, diving instructors are currently not obliged to comply with annual or recurring medical evaluations by a physician.

The aim of this descriptive study was to obtain information about the current and past medical history of Dutch scuba diving instructors in order to define future guidelines for the physical assessment of scuba diving instructors.

Methods

CONTEXT

The Dutch Underwater Federation (DUF) has 14,000 members and is the largest national diving organisation in the Netherlands providing education in diving training and issuing certifications. Levels of diving instructor are: one star, two-star, instructor trainer and instructor teacher.

In November 2018, all of the 1,819 DUF diving instructors received a regular newsletter in which they were invited to participate voluntarily in an online survey about diving experience and actual and past medical history related to scuba diving. Although this survey was exempt from the Medical Research Involving Human Subjects Act (WMO), we adhered to the guidelines as defined in the Declaration of Helsinki of the World Medical Association and the Association of Universities in the Netherlands (VSNU).[9,10]

SURVEY

The survey, which was designed in collaboration with the medical information technology faculty of the Amsterdam University Medical Center, consisted of a three-part questionnaire. The full questionnaire is shown in the Appendix* available on-line. The first part of the survey covered questions about demographics. The second part included questions on current and past medical conditions. A current condition was a condition present at the time of the survey or in the past year. A past condition was a condition that has been present at least a year before the time of the survey and may have disappeared or has led to a current condition. These conditions were divided into the following categories: cardiovascular, respiratory, ear, nose and throat (ENT) or eye diseases, neurological, psychiatry and 'other', which included musculoskeletal and endocrine problems. In the final part, the diving instructors were asked if they use prescribed and/or non-prescribed pharmaceutical agents. All the categories were subdivided to provide some more detailed information about the type of medication used.

DATA HANDLING

Responses were downloaded into Microsoft Excel (version 16.37, 2020, Microsoft Corporation, Redmond WA) for collation. All reported conditions were included in the analysis. A descriptive analysis based on means and standard deviations (SD) was conducted using Microsoft Excel.

Results

After a five-month period in which the instructors were able to complete the online questionnaire, 497 out of the 1,819 instructors (27%) completed the survey; 432 (87%) men and 65 (13%) women. This gender balance was in accordance with the group of diving instructors as a whole. Of the respondents, the average male age was 57.3 (SD 8.5) years and the average female age was 55.5 (SD 10.0) years In the respondent group 82% of the males and 75% of the females were older than 50 years of age, while in the instructor group as a whole the corresponding proportions were 66% and 51%, respectively. The average Body Mass Index (BMI) for males was 26.7 $kg{\cdot}m^{-2}$ and for females 25.3 $kg{\cdot}m^{-2}$. Table 1 summarises these results and provides details per 10-year age groups. Of the total male respondents 50.9% were overweight (BMI 25–30 $kg.m^{-2}$) and 15.3% obese (BMI > 30 $kg.m^{-2}$). About 29.2% and 14.9% of the female population were overweight and obese respectively.

When asked about their diving experience, 65% of the men and 51% of the women had more than 20 years of scuba diving. About 59% made between 1–50 dives in the past year and 30% made between 50–100 dives. A previous diving-related injury was reported by 27% where ENT problems (16%) and decompression illness (4%) were the most common, with others due to toxic or dangerous sea animals (3%) and hypothermia (2%). Tobacco use in this population was quite low: 95% of the men and 91% of the woman did not currently smoke. Of the respondents, 41% of the men and 34% of the women consumed 1–5 alcohol units per week.

Table 2 shows the current and past medical issues (all percentages are shown in relation to all 497 respondents): 231 (46%) of the respondents did not mention any current medical condition. The most prevalent current medical condition was hypertension (75, 15%), followed by hay fever (69, 14%), and equalising problems of the ears and

Table 1
Age and body mass index (BMI) ($kg{\cdot}m^{-2}$) of the scuba diving instructors

Age Years	Male *n* (%)	BMI male Mean (SD)	Female *n* (%)	BMI female Mean (SD)
21–30	3 (1)	25.4 (2.4)	3 (5)	22.6 (1.4)
31–40	13 (3)	22.8 (2.0)	2 (3)	24.2 (3.0)
41–50	59 (14)	27.0 (3.7)	11 (17)	26.4 (2.7)
51–60	211 (49)	26.9 (3.2)	30 (46)	26.1 (5.2)
61–70	122 (28)	26.8 (3.1)	16 (25)	23.8 (3.4)
71–80	24 (6)	26.1 (2.3)	3 (5)	25.4 (1.7)
Total	432 (87)	26.7 (4.6)	65 (13)	25.3 (4.3)

Footnote: * The Appendix is available on DHM Journal's website: https://www.dhmjournal.com/index.php/journals?id=82

Table 2
Current and past medical conditions among scuba diving instructors. ENT – ear nose throat, MSK – musculoskeletal

Condition	Current *n* (%)	Past *n* (%)
Cardiovascular	**92 (18.5)**	**92 (18.5)**
Hypertension	75 (15.1)	73 (14.7)
Heart rhythm disorder	13 (2.6)	12 (2.4)
Heart valve disease	4 (0.8)	6 (1.2)
Coronary artery disease	1 (0.2)	2 (0.4)
Myocardial infarction	1 (0.2)	2 (0.4)
Angina pectoris	1 (0.2)	2 (0.4)
Persistent (patent) foramen ovale	–	1 (0.2)
Respiratory	**81 (16.3)**	**84 (16.9)**
Hay fever	69 (13.9)	62 (12.5)
Asthma	9 (1.8)	10 (2.0)
Pulmonary infection	4 (0.8)	12 (2.4)
Chronic obstructive pulmonary disease	5 (1.0)	6 (1.2)
Sarcoidosis	–	1 (0.2)
Other	**80 (16.1)**	**127 (25.5)**
Joint problems or joint surgery	31 (6.2)	69 (13.9)
Miscellaneous	31 (6.2)	44 (8.9)
Diabetes I / II	17 (3.4)	15 (3.0)
Rheumatoid arthritis	6 (1.2)	5 (1.0)
Crohn's disease or ulcerative colitis	2 (0.4)	3 (0.6)
Stomach ulcer	–	3 (0.6)
ENT / Eye	**75 (15.1)**	**115 (23.1)**
Equalising problems ears or sinus	64 (12.9)	83 (16.7)
Perforated eardrum	6 (1.2)	20 (4.0)
Eye surgery	1 (0.2)	11 (2.2)
Chronic sinusitis	2 (0.4)	5 (1.0)
Retinal detachment	1 (0.2)	2 (0.4)
Inner ear surgery	–	2 (0.4)
Chronic Otitis media	1 (0.2)	1 (0.2)
Neurological	**33 (6.6)**	**60 (12)**
Migraine	16 (3.2)	24 (4.8)
Spinal hernia	4 (0.8)	17 3.4)
Recurrent headache	12 (2.4)	13 (2.6)
Brain tumor	2 (0.4)	2 (0.4)
Transient ischaemic attack	–	4 (0.8)
Meniere's disease	–	3 (0.6)
Epilepsy	1 (0.2)	1 (0.2)
Brain- or spinal cord injury	–	1 (0.2)
Psychiatric	**13 (2.6)**	**24 (4.8)**
Depression	7 (1.4)	17 (1.3)
Attention deficit hyperactivity disorder. Attention deficit disorder	3 (0.6)	3 (0.6)
Claustrophobia	2 (0.4)	2 (0.4)
Anxiety disorder	1 (0.2)	2 (0.4)
Drug or alcohol addiction	–	1 (0.2)
No medical condition	**231 (46.5)**	**160 (32.2)**

Table 3
OTC (Over-the counter) medications used by 497 instructors. More than one agent may be used

OTC medication	*n* (%)
Analgesics	185 (37.2)
Nose/eardrops	105 (21.1)
Antihistamines	38 (7.6)
Motion sickness	38 (7.6)
Antacids	37 (7.4)
Antidiarrhoeal drugs	23 (4.6)
Other	23 (4.6)
Antiemetics	3 (0.6)
None	203 (40.8)

sinuses (64, 13%). Cardiac problems (angina pectoris, coronary artery disease, myocardial infarction, heart valve disease and arrhythmias) accounted for 4% of the current medical conditions. Pulmonary problems (asthma, COPD and pulmonary infection) accounted for about 16% of the current medical conditions.

Concerning the past medical history, 160 of the respondents (32%) did not report any past medical condition. Equalising problems of the ears and sinuses (83, 16.7%) was the most common past medical condition, followed by hypertension (73, 14.7%), joint problems or surgery (69, 13.9%), and hay fever (62, 12.5%).

Regarding medication, 59% used over-the-counter (OTC) medication (Table 3). Most respondents mentioned analgesics, followed by decongestants (nose sprays and eardrops) and motion sickness medications and antacids. With respect to prescribed medication (Table 4), 28% consisted of medication prescribed for cardiovascular diseases (such as cholesterol-lowering medications and diuretics), which accounted for the largest group, followed by prescribed medication such as analgesics and antibiotics (24%). The third group contained medications prescribed for respiratory problems (10%), like corticosteroids inhalations, long-acting beta-2-agonist and nasal anti-inflammatory sprays.

One or more current medical conditions were reported by 266 (53.5%) of the instructors and 337 (67.8%) had one or more past medical conditions. OTC medications were used by 294 (59.1%) and 242 (48.7%) used one or more prescribed medication. Table 5 shows the distribution of the multiple medical conditions and multiple medications.

Of the 432 male instructors, 75 (17.4%) and 357 (82.6%) < 50 and ≥ 50 years respectively. Clinical conditions related to cardiovascular disease (angina pectoris, coronary artery disease and previous myocardial infarction) were present in 4 of the 75 male instructors < 50 years of age, and in 82 of the 357 (23%) ≥ 50 years. All male instructors with cardiovascular disease had a BMI above 25 $kg \cdot m^{-2}$. Female

Table 4
Prescribed medications used by 497 instructors. More than one agent may be used. H2 – histamine receptor 2; NSAIDS – non-steroidal anti-inflammatory drugs; PPI – proton pump inhibitor

Prescribed medication	*n* (%)
Cardiovascular	**140 (28.1)**
Lipid lowering agents	40 (8.0)
Miscellaneous	33 (6.6)
Diuretics	24 (4.8)
Angiotensin converting enzyme inhibitor	20 (4.0)
Betablockers	17 (3.4)
Calcium channel blockers	6 (1.2)
Miscellaneous	**120 (24.1)**
Analgesics	47 (9.4)
Antibiotics	33 (6.6)
Rheumatoid medications	14 (2.8)
Antidiabetic drugs	12 (2.4)
Antimalarial drugs	8 (1.6)
Miscellaneous	5 (1.0)
Antiepileptic drugs	1 (0.2)
Respiratory	**52 (10.4)**
Nasal sprays with steroids	19 (3.8)
Inhaled steroids	17 (3.4)
Short-acting beta-2 agonists	12 (2.4)
Inhaled combined steroid and long acting beta-2 agonists	4 (0.8)
Gastrointestinal	**43 (8.6)**
PPI / H2 receptor antagonists	36 (7.2)
NSAIDS	7 (1.2)
Haematology	**26 (5.2)**
Aspirin	13 (2.61)
New generation anticoagulant	10 (2.0)
Vitamin K antagonist	3 (0.6)
Hormonal	**25 (5.0)**
Oral contraceptives	10 (2.0)
Thyroid medications	6 (1.2)
Insulin	3 (0.6)
Psychiatric	**6 (1.2)**
Antidepressants	6 (1.2)
None	**255 (51)**

instructors < 50 years did not suffer from cardiovascular disease. Of the female instructors ≥ 50 years, 5 out of 65 (8%) suffered from a cardiovascular problem, hypertension in particular.

Discussion

To our knowledge, this is the first study to describe the health status of Dutch diving instructors. About one in five of the males over 50 years old was overweight and suffered from

Table 5
Distribution of instructors with multiple medical conditions and multiple medications

n	Medical conditions		Medications	
	Current *n* (%)	Past *n* (%)	OTC *n* (%)	Prescribed *n* (%)
0	231 (46.5)	160 (32.2)	203 (40.8)	255 (51.3)
1	188 (37.8)	209 (42.1)	175 (35.2)	163 (32.7)
2	56 (11.3)	95 (19.1)	45 (9.1)	61 (12.3)
> 2	22 (4.3)	33 (6.6)	74 (14.9)	18 (3.6)

cardiovascular disease. Additionally, they suffered from several other comorbidities and 59% used OTC medications and 49% prescribed medication, while 106 of the 497 (21%) used one or more cardiovascular drugs. We could not find any comparative data describing the average age of diving instructors in other organisations in the Netherlands. In wider diver populations, the average age varies from 35 years old (PADI Members and Divers)[11] up to circa 50 years old (DAN Asia Pacific members or DAN USA members).[2,11,12]

Medical issues are more common with increasing age, especially cardiovascular problems. Hypertension was seen frequently in this diving instructor population as in previous studies on divers.[13,14] Pre-existing hypertension is one of the risk factors for developing immersion pulmonary oedema and it is therefore paramount to detect and treat it accordingly.[15,16] Diving physicians should continue to monitor whether diving with hypertension and the use of various antihypertensive drugs is advisable. Guidelines should be drawn up to define whether someone is fit to dive while taking particular medications.[17] The present results show that diving instructors with cardiovascular problems were also overweight, with more than 60% having a BMI above 25 $kg \cdot m^{-2}$, which is in line with other literature.[2,11–13] Analysis of the non-cardiovascular disease population also showed that they have a mean BMI 26.9 (SD 4) suggesting that this apparently healthy population could be at risk for cardiovascular disease.[18]

The most frequently reported medications in this survey were analgesics (both OTC and prescribed), nose/eardrops (OTC) and prescribed cardiovascular medication, which is consistent with a previous study.[19] Among cardiovascular medications, antihypertensive drugs are also the most common in Australian cohorts.[13] In the present study, cardiovascular medications were more prevalent than shown in other studies on divers, which could be explained by the older population compared to the aforementioned studies.[19] Reported present and past respiratory tract problems, such as asthma and COPD, were mentioned less frequently compared to some scuba diver cohorts.[13,20] This could be attributed to a healthy worker effect, although selection bias cannot be excluded because the present cohort smoked significantly less than the average Dutch population. On the other hand, in concordance with recent literature, the present study also found a low prevalence of mental health disorders. While this could also be attributed to a healthy worker effect, it might reflect a reluctance to report psychological issues.[4]

Some limitations of this study need to be addressed. Firstly, although a similar response rate (~30%) is common in online surveys, there may be a selection bias.[21] The male-female ratio of the respondents (87% men and 13% women) seemed to represent the whole diving instructor population (87% men) accurately. However, the survey respondents are older than the total group of dive instructors who were invited which could lead to overrepresentation of certain medical conditions. Of the respondents, 18% of the males and 25% of the females were younger than 50 years old, while in the instructor community 34% of the males and 49% of the females respectively were younger than 50 years old. The self-reported percentage of smokers is in line with other studies on general diving populations, with a rate between 5% and 11%.[2,12,19] Only 5% of the male instructors and 9% of the female instructors in the present study were smokers. This compares favorably to the national average of around 25%.[22] The 'previous smoking status' was not investigated in the present survey, so it cannot be determined if the current non-smokers never smoked or quit smoking. Secondly, there might be a recollection bias. Diving instructors mention some medical conditions as a past medical issue, such as hypertension, even though they still use antihypertensive medication. From the perspective of a physician this would be regarded as an ongoing medical condition, while the patient regards it as a past condition, with the hypertension now being normalised due to medication. The questionnaire did not ask for hyperlipidaemia or hypercholesterolaemia which could have provided more detail on cardiovascular risk.

From the diving instructor population that responded to the questionnaire, 20% had an increased risk of cardiovascular events perhaps reflecting the older age compared to the average diving population. Considering the increased responsibilities of an instructor, especially when teaching inexperienced divers, it could be argued that instructor should have a higher level of cardiovascular and physical fitness than the average diver. To date, no such special requirements are imposed on diving instructors. It has been suggested for recreational divers that high cholesterol, hypertension, high BMI and smoking status should be addressed during routine assessments of diving fitness by physicians to reduce the risk of mortality while diving[23] and this should also apply to diving instructors. Even though there is a continuing debate about the pros and cons of performing a periodic health examination of healthy divers, the present results show that assessing the cardiovascular and pulmonary status of diving instructors might be necessary in certain groups at risk. As a suggested minimum, diving instructors should consult a dive medical examiner regularly and discuss their fitness to dive. For example, cardiovascular risk can be assessed by means of the Systematic Coronary

Risk Evaluation (SCORE) and this could determine if further assessment is necessary.[24] The SCORE has high and low cardiovascular risk charts based on sex, age, total cholesterol, systolic blood pressure and smoking status. Additional testing, with a resting electrocardiogram and assessment of the physiologic reserve with a bicycle ergometer, can be considered to evaluate cardiovascular status.[25] The South Pacific Underwater Medicine Society diving medical provides an algorithm for the recommended cardiovascular screening of divers in which the SCORE can be used.[26] Another algorithm based on the Global Lung Initiative might be used for pulmonary assessment.[27] With effective usage of screening tools, not every diving instructor needs to be fully examined and everyone can get an appropriate health assessment. The authors also feel that educating diving instructors with respect to the use of prescribed and non-prescribed medications during diving is necessary to create greater awareness of safe diving with pharmaceutical agents.

Conclusions

This is the first questionnaire survey of Dutch diving instructors about their medical history and use of medications. Almost 20% of instructors ≥ 50 years old had cardiovascular disease (mainly hypertension) and obesity, which can lead to medical problems during emergency scenarios with their students. Although the value of regular diving-medical assessments is debated, certain populations, such as the aforementioned group, could benefit from a more frequent assessment. The use of cardiovascular and pulmonary screening tools by the medical diving examiner can help target the population which is at risk and can lead to appropriate additional assessment. Further research is necessary to evaluate these screening tools in the diving instructor population.

References

1 Strauss MB, Busch JA, Miller SS. Scuba in older-aged divers. Undersea Hyperb Med. 2017;44:45–55. doi: 10.22462/1.2.2017.8. PMID: 28768085.

2 Lippmann J, Taylor D McD, Stevenson C, Mitchell S. The demographics and diving behaviour of DAN Asia-Pacific members with and without pre-existing medical conditions. Diving Hyperb Med. 2016;46:200–6. PMID: 27966201.

3 Divo MJ, Martinez CH, Mannino DM. Ageing and the epidemiology of multimorbidity. Eur Respir J. 2014;44:1055–68. doi: 10.1183/09031936.00059814. PMID: 25142482. PMCID: PMC4918092.

4 St Leger Dowse M, Whalley B, Waterman MK, Conway RM, Smerdon GR. Diving and mental health: The potential benefits and risks from a survey of recreational scuba divers. Diving Hyperb Med. 2019;49:291–7. doi: 10.28920/dhm49.4.291-297. PMID: 31828748. PMCID: PMC7039781.

5 Lippmann J, Stevenson C, Taylor D McD. Scuba diving fatalities in Australia, 2001 to 2013: Diver demographics and characteristics. Diving Hyperb Med. 2020;50:105–14. doi: 10.28920/dhm50.2.105-114. PMID: 32557411. PMCID: PMC7481108.

6 Buzzacott P, Denoble PJ, editors. DAN Annual Diving Report 2018 edition: A report on 2016 diving fatalities, injuries, and incidents. Durham (NC): Divers Alert Network; 2018.

7 Denoble PJ, Caruso JL, de L Dear G, Pieper CF, Vann RD. Common causes of open-circuit recreational diving fatalities. Undersea Hyperb Med. 2008;35:393–406. PMID: 19175195.

8 Mitchell SJ, Bove AA. Medical screening of recreational divers for cardiovascular disease: Consensus discussion at the Divers Alert Network Fatality Workshop. Undersea Hyperb Med. 2011;38:289–96. PMID: 21877558.

9 World Medical Association. WMA declaration of helsinki – ethical principles for medical research involving human subjects; 2018. [cited 2020 June 24]. Available from: https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/.

10 Association of Universities in the Netherlands. Netherlands Code of Conduct for Research Integrity; 2018. [cited 2020 June 24]. Available from: http://www.vsnu.nl/files/documents/Netherlands%20Code%20of%20Conduct%20for%20Research%20Integrity%202018.pdf.

11 Lippmann J, Taylor D McD, Stevenson C, Williams JW. Challenges in profiling Australian scuba divers through surveys. Diving Hyperb Med. 2018;48:23–30. doi: 10.28920/dhm48.1.23-30. PMID: 29557098. PMCID: PMC6467821.

12 Ranapurwala SI, Kucera KL, Denoble PJ. The healthy diver: A cross-sectional survey to evaluate the health status of recreational scuba diver members of Divers Alert Network (DAN). PLoS One. 2018;13(3):e0194380. doi: 10.1371/journal.pone.0194380. PMID: 29566018. PMCID: PMC5864008.

13 Lippmann J, Taylor D McD, Stevenson C, Williams J, Mitchell SJ. Diving with pre-existing medical conditions. Diving Hyperb Med. 2017;47:180–90. doi: 10.28920/dhm47.3.180-190. PMID: 28868599. PMCID: PMC6159622.

14 Beckett A, Kordick MF. Risk factors for dive injury: A survey study. Res Sports Med. 2007;15:201–11. doi: 10.1080/15438620701526779. PMID: 17987508.

15 Peacher DF, Martina SD, Otteni CE, Wester TE, Potter JF, Moon RE. Immersion pulmonary edema and comorbidities: case series and updated review. Med Sci Sports Exerc. 2015;47:1128–34. doi: 10.1249/MSS.0000000000000524. PMID: 25222821.

16 Gempp E, Demaistre S, Louge P. Hypertension is predictive of recurrent immersion pulmonary edema in scuba divers. Int J Cardiol. 2014;172:528–9. doi: 10.1016/j.ijcard.2014.01.021. PMID: 24485632.

17 Westerweel PE, Rienks R, Sakr A, Taher A. Diving with hypertension and antihypertensive drugs. Diving Hyperb Med. 2020;50:49–53. doi: 10.28920/dhm50.1.49-53. PMID: 32187618. PMCID: PMC7276276.

18 Ringbäck Weitoft G, Eliasson M, Rosén M. Underweight, overweight and obesity as risk factors for mortality and hospitalization. Scand J Public Health. 2008;36:169–76. doi: 10.1177/1403494807085080. PMID: 18519281.

19 St Leger Dowse M, Cridge C, Smerdon G. The use of drugs by UK recreational divers: prescribed and over-the-counter medications. Diving Hyperb Med. 2011;41:16–21. PMID: 21560980.

20 Taylor D McD, O'Toole KS, Ryan CM. Experienced, recreational scuba divers in Australia continue to dive despite medical contraindications. Wilderness Environ Med. 2002;13:187–93. doi: 10.1580/1080-032(2002)013[0187:ersdia]2.0.co;2. PMID: 12353595.

21 Eysenbach G, Wyatt J. Using the Internet for surveys and health

research. J Med Internet Res. 2002;4(2):E13. doi: 10.2196/jmir.4.2.e13. PMID: 12554560. PMCID: PMC1761932.
22 Bommele J, Nagelhout GE, Kleinjan M, Schoenmakers TM, Willemsen MC, van de Mheen D. Prevalence of hardcore smoking in the Netherlands between 2001 and 2012: A test of the hardening hypothesis. BMC Public Health. 2016;16:754. doi: 10.1186/s12889-016-3434-x. PMID: 27506600. PMCID: PMC4977697.
23 Buzzacott P, Edelson C, Bennett CM, Denoble PJ. Risk factors for cardiovascular disease among active adult US scuba divers. Eur J Prev Cardiol. 2018;25:1406–8. doi: 10.1177/2047487318790290. PMID: 30045634.
24 Piepoli MF, Hoes AW, Agewall S, Albus C, Brotons C, Catapano AL, et al. [2016 European guidelines on cardiovascular disease prevention in clinical practice. The Sixth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of 10 societies and by invited experts. Developed with the special contribution of the European Association for Cardiovascular Prevention & Rehabilitation]. G Ital Cardiol (Rome). 2017;18:547–612. doi: 10.1714/2729.27821. PMID: 28714997.
25 Eichhorn L, Leyk D. Diving medicine in clinical practice. Dtsch Arztebl Int. 2015;112(9):147–57; quiz 58. doi: 10.3238/arztebl.2015.0147. PMID: 25797514. PMCID: PMC4381562.
26 Jepson N, Rienks R, Smart D, Bennett MH, Mitchell SJ, Turner M. South Pacific Underwater Medicine Society guidelines for cardiovascular risk assessment of divers. Diving Hyperb Med. 2020;50:273–7. doi: 10.28920/dhm50.3.273-277. PMID: 32957130. PMCID: PMC7819720.
27 Wingelaar TT, Clarijs P, van Ooij P-JA, Koch DA, van Hulst RA. Modern assessment of pulmonary function in divers cannot rely on old reference values. Diving Hyperb Med. 2018;48:17–22. doi: 10.28920/dhm48.1.17-22. PMID: 29557097. PMCID: PMC6467825.

Acknowledgements

Medical IT faculty of the Amsterdam University Medical Center for building the online platform for the questionnaire. Toya Ahmed, Jeanne ten Have and Tijmen Beemster. Dutch Underwater Federation for the acquisition of the diving instructors.

Conflicts of interest and funding: nil

Submitted: 24 June 2020
Accepted after revision: 10 October 2020