

ARE WOMEN AT GREATER RISK OF DCI THAN MEN?

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There is much speculation about women and their risk of DCI compared with men. Some of this centres around the differences in body fat. Women have, on average, 10% more subcutaneous fat than men. Since fat holds 5 times more nitrogen than blood, it has been suggested that women might be more susceptible to DCI than men.

This article serves as a good lesson in how different conclusions can be drawn from the same data, depending on the depth of analysis that is done. It is easy to interpret results in one way when taking the data at face value, but when further sub-analysis is done by separating out potential influencing factors, different conclusions can be drawn.

More DCI cases are male than female

The DAN America Reports on decompression illness reveal that approximately two-thirds of the DCI cases are male and one-third female¹:

Table 1: Gender of injury cases of divers with DCI¹

Year of injury	Female % DCI cases	Male % DCI cases
2000	30	70
1999	25	75
1298	29	71
1997	31	69
1996	36	64
1993-95	30	70
1990-92	27	73

From the DAN statistics summary presented in *Table 1*, it would be easy to conclude that females actually have a lower incidence of DCI than males. However, there are several other pieces of information we would require before that conclusion could be drawn. The most obvious is the need to know the proportion of dives done by females compared to males.

Males do more diving than females

A survey questionnaire given to over two thousand sports divers in the UK does indeed indicate that males report doing more dives than females².

Table 2: Number (#) and percentage (%) of diver respondents compared to the # and % of reported dives, by gender⁽²⁾

	Respondents		Reported dives	
	#	%	# total dives	%
Male	1191	53.6	317,844	69.3
Female	1031	46.4	140,983	30.7
Total	2222	100	458,827	100

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The summary of responses presented in *Table 2* reveals that, whilst the proportion of respondents was fairly equal between male and females, of the 458,827 reported total dives that had been done, approximately two-thirds (317,844) were done by males and one-third (140,983) by females. On an annual basis, males averaged 56 dives per year and females averaged 37 dives per year. So, by probability of risk, it would be expected that more male divers would get DCI than females, simply because they do more diving.

One way to express the relative risk between males and females is to compare the incidence of DCI per 1000 dives.

Females had a higher incidence of DCS per 1000 dives

Of all the physician confirmed cases of Decompression Sickness (DCS) in the UK sports divers survey, 37 cases were in female divers and 50 were in male divers³. This gave an incident rate of 0.262 confirmed DCS cases per 1000 dives in the females and a rate of 0.157 confirmed DCS cases per 1000 dives in the males, suggesting a 1.67-fold greater rate of DCS in females (*Table 3*).

Table 3: Confirmed DCS rates per 1000 dives by gender³.

	# reported dives	Confirmed DCS	Incidence DCS per 1000 dives
Males	317,844	50	0.157
Females	140,983	37	0.262

Because 28% of the overall dives were 'estimated' (rather than from written diving logs) the data was analysed further by excluding the respondents who had 'estimated' their number of dives. This revealed an incidence rate of 0.263 confirmed DCS per 1000 dives in females and 0.119 confirmed DCS cases in males, resulting in a 2.46-fold greater rate of DCS in females.

But what other differences, apart from being male or female, that could account for this difference?

When taking into account 'experience' the rate of DCS was higher in males

When comparing experience and number of diving years of the physician confirmed DCS cases by gender, the effect of experience was also highly significant. When analysed by level of experience, the estimated rate of DCS in males was 2.57 times greater than for females (i.e.: for the same level of experience, a male diver is 2.57 times more likely to get DCS than a female diver)³.

The reason that the overall rates (not taking experience into account) showed the converse of this is due to the preponderance on inexperienced female divers in the survey population.

Interestingly, the rate of reported DCS diminished with increased experience. There was a 9-fold drop in rates between <2 years and <5 year experience groups, and an almost 5-fold drop in rates between <5 year and <10 year experience groups³. Similar patterns are noted in the DAN Reports¹.

The authors concluded: "*Comparison between men and women in recreational diving differed from initial evaluation when underlying factors were taken into account. Future studies should attempt to control for underlying factors in the data gathering and data analysis.*"³

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DAN data supports the suggestion that the relationship between DCI and 'experience' is stronger for females than males

Interestingly, from the DAN data on diving incidents, it appears that there is a much stronger relationship between female divers and their experience. Women who have been diving for less than two years generally account for 39-50% of all injuries in female divers⁴.

Perhaps also an indication that in recent years more women have taken up scuba diving as a recreational activity?

Summary:

DAN Reports reveal that approximately two-thirds of reported cases of DCI are male and one-third are female.

As males report doing more dives per year than females, their 'probability of risk' would be expected to be higher than females.

When expressed per 1000 dives, one survey revealed that females had a higher incidence of DCS than males, by a factor of 1.67.

However, the effect of experience is also highly significant. In the same survey, when analysed to take into account the same level of experience, rates of DCS were actually higher in males than females, by a factor of 2.6.

In other words, deeper analysis of data reveals that comparison between men and women in recreational diving differs from initial evaluation when underlying factors are taken into account.

In conclusion, any speculation as to whether females may be more susceptible to DCI/DCS than males cannot be substantiated by the data that is currently available.

There does however, appear to be a strong relationship between female divers with less than two years diving experience and risk of DCI.

References:

1. Divers Alert Network Reports on decompression illness and diving fatalities.
2. M St Leger Dowse, P Bryson, A Gunby, W Fife 1994 DDRC Men and women in diving
3. St Leger Dowse, Bryson, Gunby, Fife 2002; Aviat Space Environ Med Vol 73 No 8
4. D Uguccioni, R Moon, M Taylor www.diversalertnetwork.org