1. A study of the association of breast cancer with duration of oral contraceptive (OC) use compared a group of women with breast cancer to a group of women of similar ages who were admitted to the same hospital for non-cancer diseases. From interviews it was determined who had used OC in the past and for how long. The following data were gathered. If the underlying hypothesis is correct, then there should be an obvious trend in the odds ratios showing a change in estimated risk with increasing years of OC exposure (i.e. a “dose-response” relationship).

Duration of OC use ​breast cancer patients​ hospital controls

Never used them​​ 235 ​​​273

< 1 year ​​​​ 27 ​​​26

1-4 years​​​ 43​​​ 29

> 4 years​​​ 46​​​ 23

Dx NonDx

Exposed 27, 43, 46 26, 29, 23

Non-Exposed 235 273

**Calculate the odds ratio (OR) and 95% CI for each level of OC duration, using never users as the common reference group.**

For < 1 year: ​OR: 1.21 95% CI: (0.68, 2.12)

For 1-4 years: ​OR: 1.72 95% CI: (1.04, 2.85)

For > 4 years:​ OR: 2.32 95% CI: (1.37, 3.95)

**What do you conclude?**

The odds of having used oral contraceptives (OC) for a duration >4 years among those with breast cancer is 2.32 times higher than the same odds among those with no breast cancer. We are 95% confident that the true odds ratio (OR) is between 1.37 and 3.95 (we would observe an OR as low as 1.37 or as high as 3.95 for this association). This is a statistically significant association because the lower limit of the confidence interval (CI) of 1.37 is greater than 1, meaning that we can reject the null hypothesis that the OR = 1 (the estimated disease risk is the same for the exposed and nonexposed). The OR for OC use <4 years (specifically 1-4 years and <1 year) and breast cancer is not significant in that 1 is within the 95% confidence intervals for both OC duration use groups, and so we fail to reject the null hypothesis for these two groups (although technically the lower confidence interval (CI) for OC use of 1-4 years and breast cancer is just barely above 1, I think more subjects need to be brought-in or the power of the study must be known).

**Is there a dose-response trend?**

There does appear to be a dose-response trend, as OC use increases so to does the OR and the lower limit of the 95% CI (as exposure to OC increases, so to does the risk of developing breast cancer).

**If you disregard the duration of OC use, and lump together all the OC users, what is the odds ratio and the corresponding 95% CI? Is this result statistically significant?**

Lump OC Use: OR: 1.73 95% CI: (1.23, 2.42)

Yes, this result is statistically significant because the lower bound of the confidence interval is greater than 1, and so we can reject the null hypothesis that OR = 1.

**Your conclusion:**

The odds of having used OC for any duration among those with breast cancer is 1.73 times higher than the same odds among those without breast cancer. We are 95% confident that the true OR is between 1.23 and 2.42 (we would observe an OR as low as 1.23 or as high as 2.42 for this association. This is a statistically significant association because the lower CI of 1.23 is greater than 1, meaning that we can reject the null hypothesis that OR = 1.

2. A study was conducted in a local hospital to assess maternal smoking as a possible risk factor for having a low birth weight baby (<2500 grams). The comparison group was mothers who had a normal size baby. A laboratory analysis of the mother’s blood was performed at the time of delivery in the hospital to detect nicotine and the following data were observed.

Group​​ nicotine detected not detected​ total

Low birth weight​ 20 ​​5​​​ 25

Normal weight ​​88 ​​210​​​ 298

Total ​​​108​​ 215 ​​​323

Dx NonDx

Exposed 20 88

Not-Exposed 5 210

**What is the odds ratio for having a low birth weight baby for the two groups of mothers? Find the 95% CI for the OR.**

OR: 9.55 95% CI: (3.47, 26.24)

**Is there a relationship between the agent and the disease? – explain your conclusion.**

The odds of having nicotine present in the blood at the time of birth among women who had low birth weight children is 9.55 times higher than the same odds among those with normal birth weight children. We are 95% confident that the true OR is between 3.47 and 26.24 (we would observe an OR as low as 3.47 or as high as 26.24 for this association). This is statistically significant because the lower limit of this confidence interval (3.47) is greater than 1, and we can reject the null hypothesis that OR = 1. Based upon this finding and a brief literature search there is strong evidence that there is a relationship between the agent (nicotine in the blood at the time of birth) and the disease (low birth weight).

Shown work:



