Depression & Multiple Sclerosis

Research Example

Aliza Ben-Zacharia DrNP, ANP
Example - Outline

* Introduction
  * Depression & MS
* Research Question?
* Hypotheses
* Study Design
* Tools/Variables
  * Beck Depression Inventory (BDI)
    * BDI-II
    * BDI-Fast-Screen (BDI-FS)
  * EDSS
  * Relapses
  * Demographics
* Collection of Data/SPSS
* Sample Size & Power
* Non-Normal vs. Normal Distribution
* Results
  * Descriptive statistics
  * Pearson correlation
  * Chi-Square
  * Discussion
  * Strengths & Limitations
Major depressive disorders and suicide are highly common in MS.

Despite the high prevalence, only half of patients are screened.

Depression and Suicide ideation often remain undetected.

Vincent Van Gogh’s 1890 painting “At Eternity Gate”
Depression & Multiple Sclerosis

- MS is a progressive inflammatory disease
- Depression is a chronic disease
- Upregulation of pro-inflammatory cytokines
- Questionable relationship between depression & progression of MS
- Studies have shown conflicting results regarding the relationship between depression and progression of disease
- Cause & effect relationship is questionable
- Chicken-Egg phenomenon:
  - Depression ↔ MS
The magnitude of Depression & Suicide in MS

- The lifetime prevalence of major depression among individuals with MS is 50%
- Untreated depression can lead to
  - 1) Immune dysregulation associated with MS
  - 2) Significant social and functional impairments
  - 3) Suicide - 7.5 times higher than in the general population
Define the question simply and clearly identify the dependent variable (outcome) and the independent variables (variables leading to the outcome).

What is the relationship between Depression & MS as measured by the Expanded Disability Status Scale and relapse rate?

May add other variables – MRI disease or others for example Optic Coherence Tomography (OCT).
**Null Hypothesis**
* There is no relationship between depression & MS
* There is no difference between the BDI-II and the BDI-FS

**Alternate Hypotheses**
* There is positive or negative relationship between depression and MS
* People who had low or high level of depression as measured by the BDI will have different MS disease based on the EDSS and relapse rate
* There is a difference between the BDI-II and BDI-FS in identifying depression
Conceptual Framework: Behavioral-cognitive Theory

- Major life stressors can result in depressive disorders
- Mobilization of support from family and support networks may result in a negative feedback and reinforcement of a depressive behavior
- Depression is mediated by environmental stimuli and by the individuals’ attendance to stimuli
- Biological/organic etiology for depression

Davidson et al., 2004; Lovejoy & Matteis, 1997
**Study Design**

- Correlational descriptive
- Cross-sectional study
  - Assessing BDI-II & BDI-FS, EDSS & Relapse rate once during the study
  - One point assessment

**Dependent Variable**
- MS disease level
  - EDSS (Ordinal Scale & as categorical)
  - Number of Relapses

**Independent Variable**
- Depression (BDI)
  - Numerical
  - Categorical
Methods

* Cross-sectional study
* Convenience sample
* Small sample size n=34
* Statistical methods
  * Descriptive statistics
  * Spearman correlation
  * Logistic regression
Instruments

- Beck Depression Inventory – II (BDI-II)
- Beck Depression Fast Screen (BDI-FS)
- Expanded Disability Status Scale (EDSS)
- Number of Relapses based on chart review and demographic sheet data
The Beck Depression Inventory (BDI)

- **Sadness**
  - 0. I do not feel sad.
  - 1. I feel sad much of the time.
  - 2. I am sad all the time.
  - 3. I am so sad or unhappy that I can’t stand it.

- **Suicidal Thoughts or Wishes**
  - 0. I don’t have any thoughts of killing myself.
  - 1. I have thoughts of killing myself, but I would not carry them out.
  - 2. I would like to kill myself.
  - 3. I would kill myself if I had the chance.
Collection of Data

- Consent form
- One point data collection
- One follow up visit
- Input data into SPSS
- All patients data collected from one large MS Center
Definition of Variables

* **EDSS** = EDSS ≤ 4 - Mild & moderate disability
  * EDSS change by 1 point on the scale
* **Relapse** = Number of relapses (acute attacks)
* **BDI** = Depression measured by the Beck depression Inventory
  * BDI as categorical variable
    * BDI-II - + depression ≥ 14
    * BDI-FS - +depression ≥ 4
  * BDI as ordinal variable
Expanded Disability Status Scale (EDSS)

EDSS ≤4 = Ambulatory; Mild to moderate disability
EDSS >4 = Increased disability requiring assistive device to walk or wheelchair
Relapse Rate

- Number of Relapses
  - Number of relapses in 1 year
  - Number of relapses in 3 years
- This study assessed number of relapses not severity of relapses
Other Independent Variables

- Age
- Gender
- Ethnicity/race
- Education level
- Work
- Marital status
- Living alone or with others
- Type of MS
- Type of DMT
- Smoking
- Alcohol
- Vitamin D
Sample Size & Power

- A Power level chosen is 80%
- A level of significance of 0.05
- Distribution & type of variables
- G-Power software (free download) helps you to calculate sample size
- http://www.gpower.hhu.de/
Normal Distribution

- Normal distribution – the variable parameters are around the mean for example +2 and -2 from the standard deviation
- Standard deviation – the distance of the result from the mean for example the BDI value of all the participants around the mean or a very heterogenic group
- You need to check the distribution of your results before deciding upon statistical tests to use in your study
Normal Distribution

- 68.2% within 1 standard deviation (SD)
- 95.4% within 2 standard deviations
- 99.7% within 3 standard deviations
Think about the appropriate statistical tests for the distribution

* Normal distribution – comparing between the mean of different groups – Parametric tests: ANOVA, ANCOVA, T test, Regression

* Non-Normal distribution – comparing between the median of different groups – Non Parametric tests: Kruskal Wallis, Mann-Whitney, Chi Square, Regression
Statistical Analysis

* Think about the appropriate statistical tests for the different type variables
  * Interval or Ratio variables – Pearson correlation
  * Ordinal & interval variables – Spearman correlation
  * Categorical 2 x 2 table – Chi Square analysis
  * Multi-categorical – Kruskal Wallis & Mann-Whitney
  * Categorical variables – Logistic regression for dependent categorical variable – dichotomous or multinomial
Results: Sample Demographics

* N = 34 subjects with MS (85% RRMS)
* Mean age 41.6 (SD – 12.5, R = 19-74)
* 88.3% had college or postgraduate education
  Mean yrs education 16.7 (SD – 2.8, R = 10-23)
* 70.6% Female
* 73.5% Caucasian
* 67.6 % Married or lived with partner or family
* 70.6% worked full time
Results: Depression Prevalence

* There was a significant positive correlation between the BDI-II and BDI-FS ($r = .82, p = .01$)

* The prevalence of depression as assessed by the Beck Depression Inventory-II (BDI-II) was 15% with two subjects identified as having major depression, compared to 21% as measured by the Beck Depression Inventory Fast-Screen (BDI-FS) with three subjects identified as having major depression
The BDI-FS identified significantly more depressed persons than the BDI-II ($X^2 = 22.61$, df = 1, $p < .001$)

There was no correlation between the extent of disability or number of MS relapses and depression as measured by either the BDI-II or BDI-FS

The study supports the ability of both tools to identify depressive symptoms among individuals with MS
Strengths of the Study

- Multiple variables / confounders
- Different statistical analyses
- Sample size
- Similar demographic characteristics as the general MS population
- Potential generalizability of the study
- Basis for future study – Prospective Cohort
Limitations of the Study

- Cross-sectional study
- The EDSS calculation is based on one point of study
- Selection bias of participants
- Onset of disease not correlated with BDI testing but may control for duration of disease
Conclusions

* Depression, appetite changes, sadness and loss of pleasure are determinants of suicide in MS
* Early screening is critical in clinical practice
* Larger studies are warranted to show the associations

"What is depression like? It's like drowning. Except you can see everyone around you breathing."

Thank You!

Cats are natural Antidepressants

Lucy & Max

Side effects: chewed furniture, allergies, sleepless nights, scratches, and furry house

Thank You!