

# Pathology Study for Human Suicide

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## Abstract

Wide spectra of risk factors can generate human suicide episodes and victim. To achieve an ultimate goal of suicide management, pathological origin and progress of human suicide should be unveiled. Current different suicide origin and pathological progress between susceptible population, mental disordered patients and normal people should be understood. Therapeutic knowledge may be built by translating different types of pathology knowledge into clinically technical modernization (diagnostics and instruments).

## Introduction

### Current situation

There is a great amount of suicide events and mortality globally [1-3]. Nevertheless, pharmaceutical drugs and clinical managements may be improved by growing understanding of suicide origin and pathology at genetic and molecular levels. New diagnostic systems may promote the efficacy of suicide prediction, prevention and therapeutics in the future [4-5].

### Molecular diagnosis

Wide spectra of clinical parameters (genetic, omics, synoptic, neural circuit and brain imaging) can be used to predict and treat human suicide. No biomedical convention has provided enough pathological information for suicide prediction. To achieve an ultimate goal of clinical suicide management, pathological origin and pathways should be identified by analyzing neuropsychiatric data and parameters between susceptible population and normal humans [6-8].

## Medical knowledge

### Mood disorders

There is a long history of knowledge and technical progresses in humans (suicide diagnosis and clinical therapy). These progresses look similarity but have great differences in pathological and therapeutic framework. If we carefully analyze different categories of potential suicide pathways, more sophisticated diagnostic techniques and relevant therapy will be created.

### Association and difference between suicide and mood disorder

In the first chapter, we describe the correlation between suicide and mood disorders in clinical symptoms [9]. However, there are also many other profiles, correlation, variability and characters between them.

Like suicide, the epidemiological data of mood disorder is equally distributed (Table 1). It shows that female patients with mood disorder are more popular than their male counterparts. However, it shows that male suicide rates are usually higher than female suicide rates except China [4]. This mystery character is waiting for further validation. The underling causality for this unparallel rate needs to be discovered at

Table 1. Epidemiological statistics for mood disorders [7]

|         | White | Irish | Africa/<br>Caribbean | India | Pakistan |
|---------|-------|-------|----------------------|-------|----------|
| Males   | 2.7%  | 5.8%  | 5.6%                 | 2.5%  | 3.8%     |
| Females | 4.8%  | 6.8%  | 6.4%                 | 3.2%  | 2.9%     |

pathological levels. Are there any impulsive pathological mechanisms in suicide ideation and episodes? Today, there is no direct answer for it.

### Biological difference

Human suicide events do not occur in all human population. It varies in age, gender, geographic and occupations [6]. Pathogenic progresses and stages may be sequential, cascade or reversible by drugs or other treatments. A wide variety of insiders (human genetic variation, plasma escalation for hormones and chemistry of different neural transmitters in humans) may determine human depressive conditions, suicide ideation and finally human mortality. It suggests that biological structure, function and chemistry are causative matter for many subsequent human suicide and mortality.

## Pathological pathways

### Human psychiatric changes

People nowadays see the suicide ideation and attempts by outside variables. They see less that genotypic or phenotypic alterations may also affect human suicide rates impacted outside pressure and consequence, especially in stochastic ways in the clinic. A heat wave of genetic and molecular associations between psychiatric symptoms and suicide behaviors is a future trend. Genetic study for mental disorders is just emerged over the past decade due to technical advances, such as next-generation clinical psychiatric or suicide risk prediction and

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prevention in neuroscience (gradual maturity in modern diagnosis and prognosis). In order to keep this momentum, proposed pathological progresses are suggested in Table 2.

Disease progress in background density.

This “outside-to-insider modality” can impact medical landscape in the clinic in the future. It should be very useful in the clinic if it is the truth. It is technically and theoretically unfinished now. Yet ethically issue is still one of the biomedical challenge now (lacking non-invasive technology in the hospitals). Maybe we should wait for more time to embrace new techniques, smart animal models, computational analysis and clinical diagnostics in wider-range.

### Knowledge gaps

Diagnostic comparison between suicide risks and mood disorder is a modern challenge. Yet, the modern biomedical diagnostics (genetics variation, synaptic abnormal, neural circuitry and brain image) improves in accelerate speed. Mental disorder (especially mood disorders) is an excellent vehicle to promote clinical researches for human suicide [2,9-12]. Following details may be noted;

Mental disorders are classified into several dimensions. Most of which are associated with higher suicide events, episodes and mortality. Different suicide risks (symptoms or neural-oriented) are associated with higher suicide rates, behavior and mortality. The knowledge gap (similarity and diversity between suicide symptoms and biological-variation should be filling in the future (Table 3).

The different pathological knowledge may come from disease domain generalizing.

### Immune system damages

Human immune system damages are associated with human depression and mental disorders. The evaluation of human immunity may be useful for suicide prediction and treatments. This topic and knowledge develop is an emerging discipline for human depression and suicide treatment. More study is indispensable.

**Table 2.** Proposed pathological evolutionary mechanisms of certain kinds of human suicide

| Pathological progress of human suicides |                  | Treatment                       |
|---|------------------|---------------------------------|
| Outside pressure                        | Traumatic injury | Alleviation measures            |
| Unpleasant feelings                     |                  | Psychological intervention      |
| Depressive symptoms                     |                  | Modern diagnosis and treatments |
| Neural biological dysfunction           |                  | Technical intervention          |
| Psychiatric diseases                    |                  | Drugs or others                 |

**Table 3.** Central nerve system characters

| Types                | Symptoms  |
|----------------------|---|
| Sleeps               | Abnormal dreams<br>Difficult sleep (insomnia)<br>Somnolence<br>Fatigue            |
| Psychiatric symptoms | Irritability<br>Nervousness<br>Memory loss<br>Dizziness<br>Impaired concentration |
| Emotional            | Mood change<br>Sadness<br>Hyperhidrosis<br>Euphosia                               |

### Inflammatory machinery

Serious human depression may combine with human brain, gastrointestinal symptoms and inflammatory hormone escalation. Some anti-inflammatory agents, drugs or herbs, such as minoumeisu are reported to manage human mental health and suicide in previous reports [13].

### Gut-brain axis

The latest discovery suggests that human mental health problem is not restricted in human brain. Human gastrointestinal systems play key roles for human mental health and sleep problem. Some microbial regulatory or food consuming (vegetable fibers or antibiotics) may be associated with suicide behaviors [14-15]. This is an important area for further investigation in human mental study.

### Drug utility

Overdosing of therapeutic drugs may induce human suicide and many other types of undesired side-effects [16-23]. The therapeutic relationship between drug-induced suicidal ideation and human genetic variation, (especially single nucleotide polymorphism, SNP) has been especially interesting [16-23]. This kind of genetic variation is especially targeted to metabolizing enzymes (CYP2D6 and others) other than that of brain functional molecules. The drug metabolizing enzymes can alter drug level in human blood and drug administration interval (absorption, distribution, metabolizing, excretion and toxicity, ADMET).

### Clinical diagnosis

#### Pharmacogenomics

In clinical PG diagnosis, the pathophysiologic molecules and pathways are less common than polymorphism of metabolizing enzymes. Since there is a strong relationship between drug blood concentration, therapeutic efficacies and side effects, monitoring therapeutic efficacies and toxicities of many psychiatric drugs is very important and needs to shed new light. Drug-toxic molecules and drug-targeted molecules are proposed to be different mechanisms.

#### Pathology diagnosis

To update modern diagnosis for human suicide, understanding the pathological processes and network is indispensable. It provides patho-therapeutic information of human suicide. The best genetic or molecular candidates for drug therapy prediction are new frontiers in suicide study and have great biomedical significance and impacts. Genetic panels affecting both drug-active and drug-toxic genes (molecules) might be indispensable avenues for in-depth scientific investigations of patient’s suicides and self-injure [20-22]. New technique invention for clinical suicidal diagnostics is very useful. It may increase the specificity and reduce therapeutic costs.

#### Image-based diagnosis

Apart from genetic or molecular diagnosis, brain or cerebral atrophy or change [24-28] and human facial image is a hotspot in mental health treatment study. Yet, it is at a primitive stage. Human facial image and eye movement rates are useful parameters for human cognitive/behavior damage and neurodegenerative diseases (Alzheimer and Parkinson diseases). Would this type of image diagnosis be useful in human suicide prediction? It may contain individual cerebral

structure variations or software imperfections. As a result, further scientific investigating relationship and knowledge gaps between visual changes and genetic/molecular variations are needed.

## Future directions

### Overview

Associations between “suicide pathology” and modern diagnosis are important for modern suicide medication. Following pathways may be useful for clinical trials. To understand that, headlines are promoted;

### Previous hypotheses

- Identifying relationships between environmental stress and human personality.
- Genome-wide associate study (GWAS) between patients and normal people [29-35].
- Algorithm, stochastic, algebra, statistics comparisons of human suicide (risks, evidence and mortality).

### New ideas, mechanisms and technologies

- Finding out genetic/molecular/visual-based diagnostics [16-17]
- Modern animal models such as genetic-knocked out, opto-genetics, bioinformatics, genetic engineering mice (GEM), genomic editing and others may be integrated into suicide study [36-41].
- Genetic study of repeated DNA for diagnosis, new drug discoveries and clinical therapeutics
- Invitation of more mathematics or physics major students and scholars in suicide investigation.

In the future, growing attentions should be paid on suicide diagnostics and therapeutic choices, especially on the relationship between chemical, genetic, molecular, environmental and social factors for therapeutic outcomes. We look forward to scientific promotions on personalized medicine [42].

## Conclusion

Suicidal episodes are determined by etiology (environmental variables) and human personality (genetics and past training). We look forward to a new suicide landscape in the future.

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