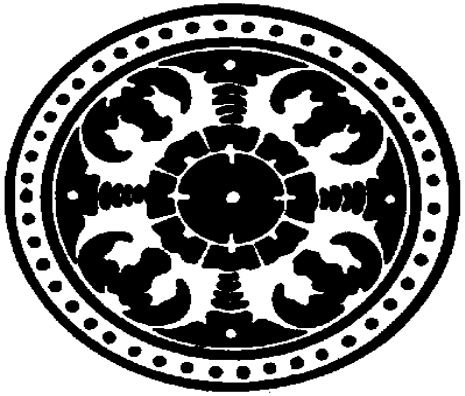
MANAGEMENT OF METHANOL INTOXICATION

Dr I Wayan Sudhana



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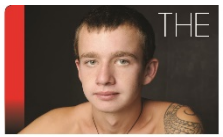

THE L.I.A.M CHARITABLE FUND

INTRODUCTION

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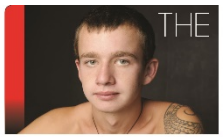

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Alcohol Intoxication

Ethanol, Methanol, ethylene, glycol, dietilen glycol, propylene glycol, alkoholik keto asidoisis & isopropanolol

Often appeared in society

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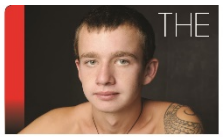

- Nowadays, alcohol is consumed by world society widely. Mild - moderate level - decrease anxiety, euphoria-happiness
- AS : almost 75% adult population drink alcohol regularly
- 10% abuse alcohol - alcoholics
- Consumed Methanol - Dangerous - Immediate attention

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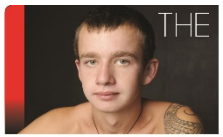

- Methanol /CH3OH methyl alcohol, carbine, wood alcohol are obtained by the distillation process at a lower temperature than ethanol, at 64.5°C boiling point, with the characteristic: light, flammable, toxic, and has a specific scent
- Used as alternative substance to petrol, fuel for heating and cooking, industrial dissolving material, material in photocopy liquid

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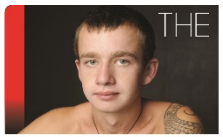

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- Methanol Poisoning rarely occurs in USA→ greater Methanol and Alcohol controls.
- Indonesia (Bali & Lombok) → the number of the death is 45 people & 13 people permanantly blind as well as more than 10 tourists (2013)
- Bali is a tourism area – it is important that you know the Methanol poisoning symptoms, and react fast

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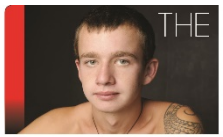

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ETHIOPATOGENESIS

- Methanol intoxication occurs by two mechanisms :
- 1st : methanol which is swallowed, sniffed, or absorbed by the skin could compress the central nervous system such as ethanol intoxication
- 2nd : Intoxication of Methanol happened after getting fission by alcohol dehydrogenate / ADH enzym to be formaldehyde and format acid in Hepar

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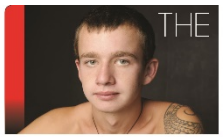

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ETHIOPATHOGENESIS

- Format acid >> is oxydated by tetrahidrofolat CO2 & H2O
- Format acid methabolism is very slow to be accumulated >> acidosis metabolic
- format acid is also obstructing celular respiration >> lactat acydosis and cell or tissue damage
- Methanol absorption is getting slowed if: there’s food in GI tract especially protein and fat

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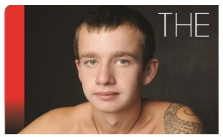

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ETHIOPATHOGENESIS

After getting absorbed >> methanol is distributed to all tissues and body fluid, except fat and bone (low concentrate)

- The concentration in blood is reaching its maximum ½ to 1 hour after being consumed
- The concentration in brain (after reaching the balance) : lower than in the blood
- Normal : body could metabolize 10 g of pure methanol, if it's consumed excessively >> increasing of the concentration in the blood>> start to show intoxication symptom. Except it has a tolerance to methanol

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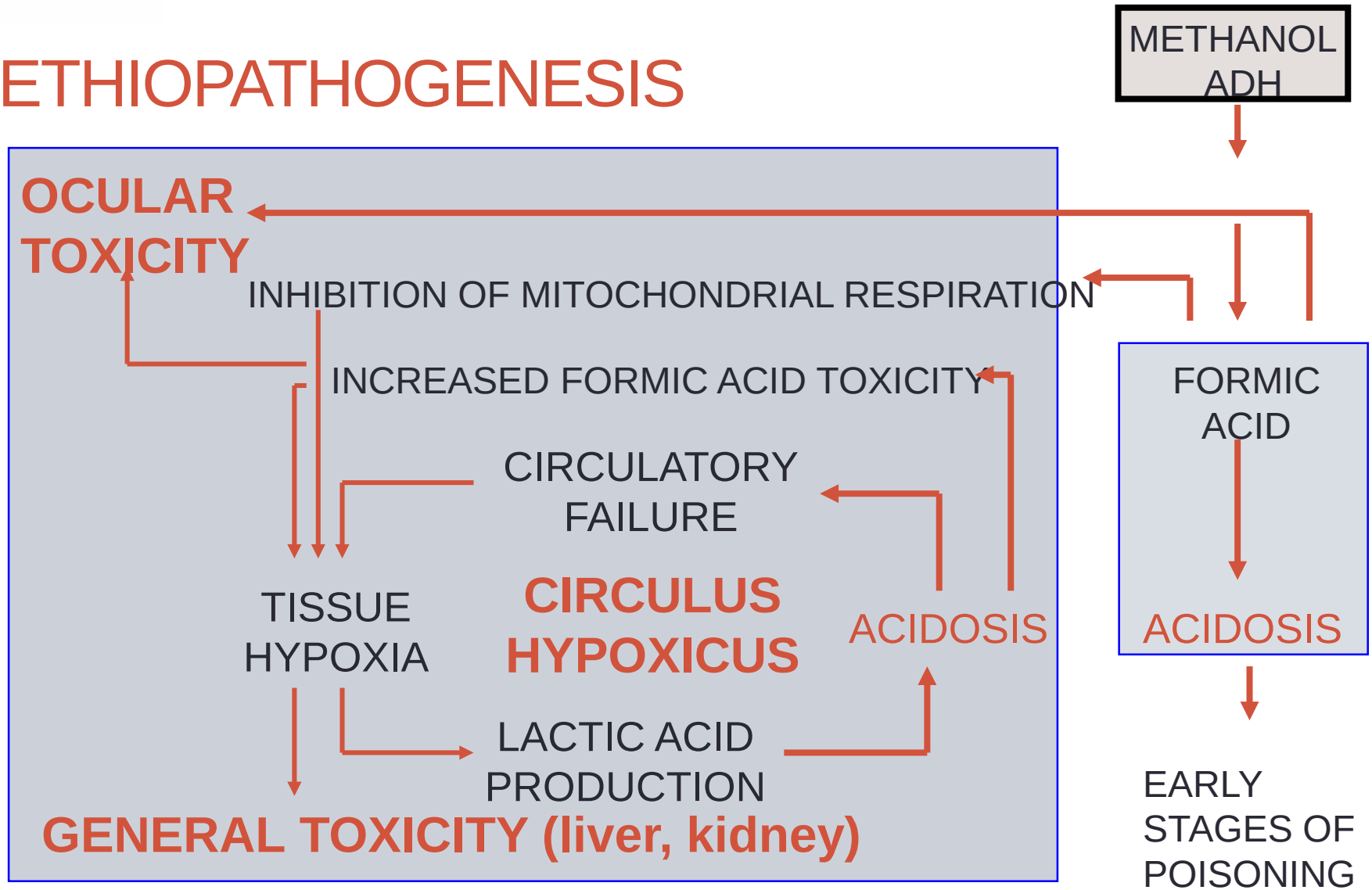
ETHIOPATHOGENESIS



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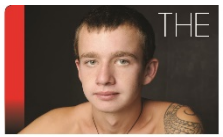

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Methanol = Metil alcohol = wood alcohol = spirits

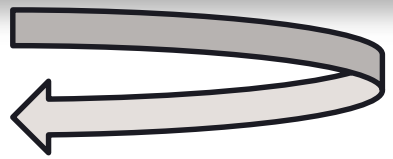
METHANOL ➔ are obtained by distillation processes at the lower temperature than ethanol, at 64.5°C boiling point, with the characteristic: light, flammable, toxic and has a specific scent. Used as dissolving fuel, additive substance in industry

Toxic dosage: 15-500ml in 40% blend to 60-600ml in pure methanol

Metabolyze in Hepar: ADH ➔ Formaldehid ➔ ASAM FORMAT ➔ 0ksidasi oleh Tetra hidro folat : H2O & CO2

Absorbed by skin, airway, GI tract➔body fluid

actually it has low intoxication
Toxic ➔ metabolyzed to: ASAM FORMAT ➔ slow metabolyze ➔ stack ➔ ASIDOSIS



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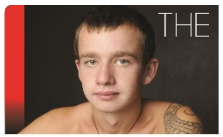

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Methanol INTOXICATION

- Related to the development of anion gap severe metabolic acidosis
- Methanol metabolized in hepar by alcohol dehydrogenase (ADH) □Formaldehyde □Format acid+ lactat acidosis □ severe metabolic acidosis
- Increasing of anion gap and osmolar gap acidosis metabolic: important warn to diagnose methanol intoxication

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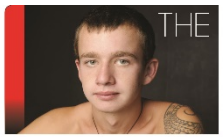

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Methanol Poisoning Symptoms

Eye, appear 4-24 hr after methanol consumption **Cause: stack of formaldehyde that ruin retina's oxidation phosphorylation & format acid which ruined optic disc**	**Blur ➔ scotoma ➔ BLIND** **Emergency treatment ➔ fail ➔ disability** **Assessment : pupil reflect slow, pupil dialatation, narrow of vision** **Funduscopy: odema of retina/ hyperemia in optic disc**
CNS : after 6-24hrs, or longer 72-96hrs if patient drink ethanol **Damage: basal ganglia, putamen, necrosis of the cortex ➔ disability (MRI)**	**Bleeding /No** **Hard to start moving** **Parkinson/dystonia/ hypo kinetic** **unconsciousness: apatic – coma, seizure**
Lab: osmolarity of the serum high, metabolic acidosis anion gap high because of the stack of format acid	**Kusmaul : rapid and deep breath**
Dx: measurement of methanol level in blood	**Useful to check the achievement of therapy**

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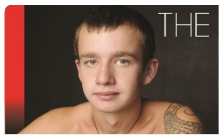

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MANAGEMENT INTOXICATION OF METHANOL

DECONTAMINATION ➔ depend on how it applied

Eye: clean water irrigation / NaCl 0,9% 15-20'
Skin: splash with water 10', contaminated cloth should be taken off
Digestion: empty the gastric if the contaminated more than 1 hr (KL)

Patient getting coma: protect the airway with *rendelenberg position or turn to left or the right side with* endotrakheal intubation

Absorbent: active charcoal 1g/kgBB (30-100g) blended with water (5-10g charcoal : 100-200 ml water)

Management of Methanol Poisoning

Supportive therapy	Protect the airway, Oxygen, liquid
Forced diuretic	Methanol excreted by kidney
Fomepizole	Stop ADH
Etanol	Competitive ➔ metabolyzed by ADH
Na.bikarbonat	Correction to acyosis
Asam folat	Degradation of format acid ➔ CO2 & H2O
Hemodialisis (best)	Eleminating toxic metabolic, acidosis correction, prevent lung odema, brain odema, renal failure

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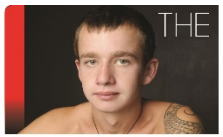

Management of Methanol Poisoning

Hemodialysis (HD), use to :

Eliminating toxic metabolic, acidosis correction, prevent lung odema, brain odema, renal failure

HD ➔ 40-50X faster than renal clearance

Indication:

Severe acidosis metabolic (pH,7,2)

Doesn’t give a good response to renal failure therapy, vision disturbance, methanol concentration in blood >50 mg/dL

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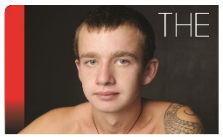

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Antidote Methanol Poisoning

Folate acid

- IMPORTANT, format acid metabolism ➔ CO2 + Air ➔ depend on providence of folate acid in the body. Dosage: 50mg iv every 4-6hr for some days

ETANOL infused

- If you suspect the patient consumed methanol > 20mg/dL
- Fixed diagnosed given : methanol intoxication

ETANOL

- Competitive characteristic inhibitor for alcohol dehydrogenase ➔ methanol metabolism will be blocked, if the affinities 20X > dp methanol ➔ delay the methanol half life till40hrs
- Concentration of ethanol in blood will be stay 100-150 mg/dL

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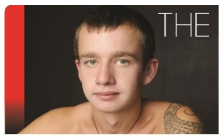


Other Antidotes

1

Fomepizole / 4-metilprizol: Ethanol work way like

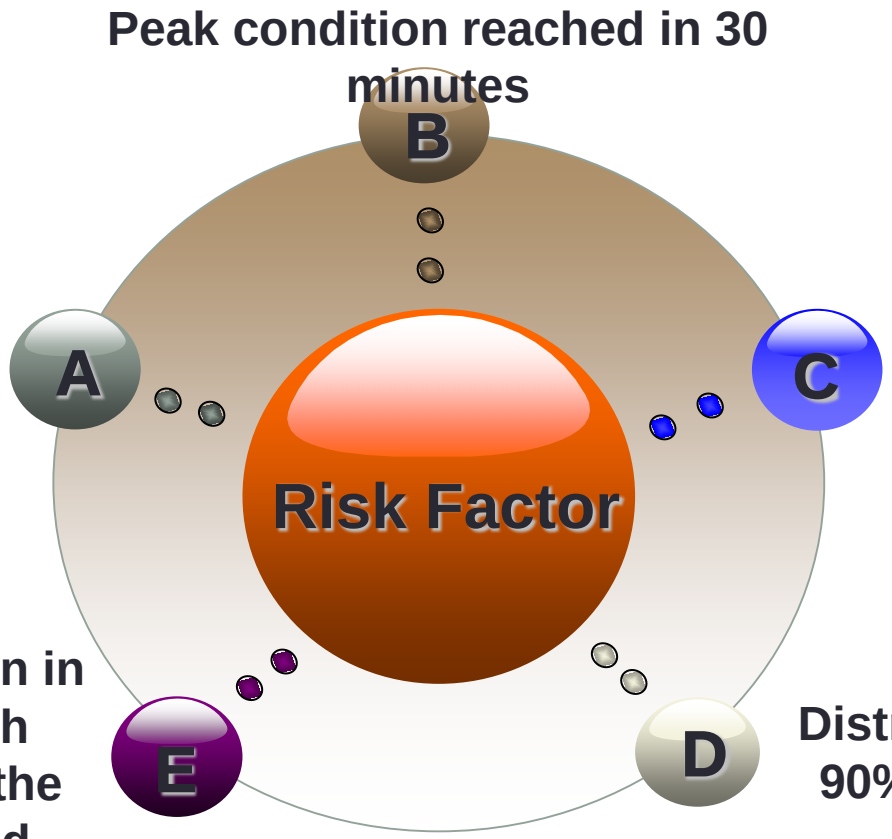
2

Has a stronger blockage than ethanol, but have no moderate sedation & longer half life

3

Dosage:
20 mg / kg BW / day

Ethanol


Peak condition reached in 30 minutes
B
Small molecule dissolved in water, absorb fast in GIT
A
Risk Factor
C
Food in the intestine slowed the absorption
Concentration in CNS is high because of the much blood supply to the brain & pass BBB
E
D
Distribution is fast 90% oxidation in hepar
And the remain is excreted by lung and urine

Acute Methanol Effect

mild: Sedation, decrease anxiety. Consentration > ➔ drunk: talk & do something uncontroably measurement disturbance Severe ➔ unconcioussness

Concentration >100mg/dL ➔ heart muscle depression

vasodilator characteristic ➔ hypothermia, hypotension, skin redness

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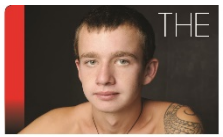

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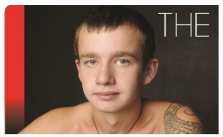
Result of methanol intoxication research at extra ordinary event



- **Ratih Wulansari, Sudhana and friends in 2002 reported :**
- **15 patients (male) hospitalized because of methanol intoxication**
- **21-25 yrs old**
- **Symptoms appears 24-48 hrs after drank**
- **Main complaint when hospitalized:**
  - **Breathless 9 (60%) patients**
  - **Blur vision1 (6,7%) patients**
  - **Unconsciousness 4 (26.7%) patients**
  - **Vomit/nausea 1 (6.7%) patients**

- **Lab result:**
  - leukocytosis in 10 (66.7%)
  - secondary polycythemia in 8 (53.3%)
  - hyper glycaemia in 4 (26.7%)
  - Increasing of AST levels > 2 times : 6 (42.9%)
  - Increasing of ALT levels > 2 times : 4 (26.7%)
  - Increasing of **creatinine levels : 6 (40%).**
  - Blood gas analyzing :
    - **13 (86.7%) metabolic acidosis**
    - 5 (33.3%) pH < 6.9,
    - 1 (6.7%) hyponatremia
    - 4 (26.7%) hyperkalemia

- **Patients treated with bicarbonate sodium, thiamin iv & folate acid oral**
- **6 (42.9%) patients hemodialysis treatment**
- **8 (53.3%) patients die**

- Sudhana , et al in 2002 reported : Of the 15 patients, 60% methanol poisoning with acute renal failure (AKI) Metabolic acidosis compensation is a picture of the main pulmonary disorders blood gas analysis

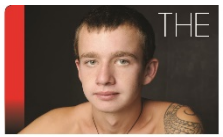
Clinical Manifestations of Methanol Intoxication in Sanglah General Hospital, Denpasar, Bali, 2009

- **Hildebrand Hanoch Victor*,**
- **Yenny Kandarini**, I Wayan Sudhana**, I Gde Raka Widiana****
- **Jodi S. Loekman**, Ketut Suwitra****

*** Department of Internal Medicine, Medical Faculty of Udayana University / Sanglah General Hospital, Denpasar, Bali**

- **** Nephrology Division, Department of Internal Medicine,**
- **Medical Faculty of Udayana University / Sanglah General Hospital, Denpasar, Bali**

Results



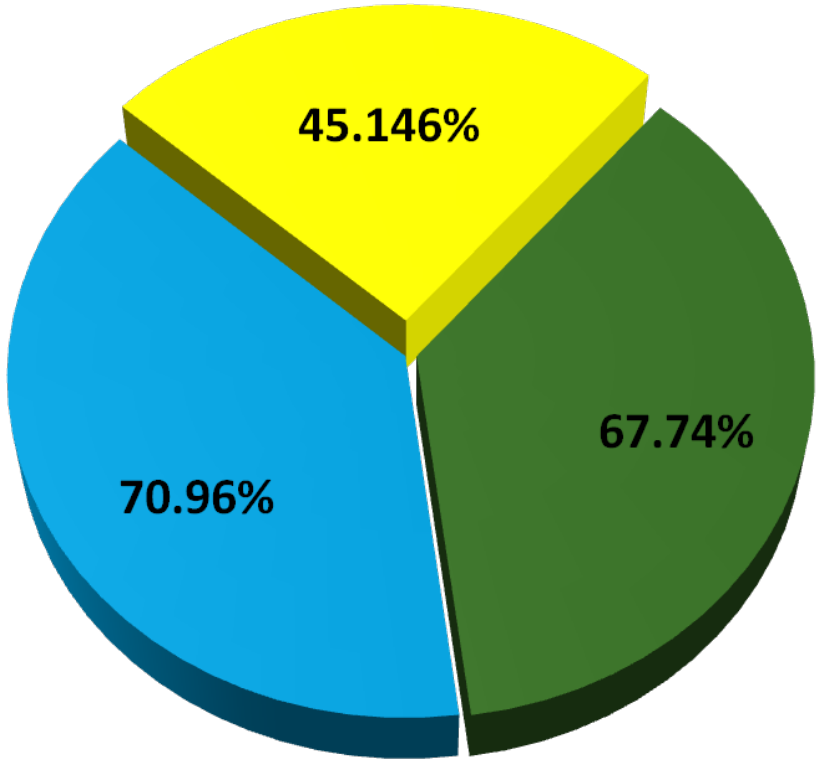
From 31 patients :

- 93,54% (29) were male
- range of age from 18 to 57 years old

Clinical Findings :

- 45,16% (14) with DOC
- **70,96% (22) with vision disturbance**
- 67,74% (21) with gastrointestinal upset (abdominal pain, nausea, vomiting)

Clinical findings of Methanol intoxication



Results

Laboratory findings :

pH < 7,1	**: 54,83% (17)**
pH 7,1 – < 7,2	: 19,35% (6)
pH 7,2 - 7,35	: 22,58% (7)
pH >7,35	: 3,22% (1)
HCO3 < 10	**: 90,32% (28)**
HCO3 > 10	: 9,68% (3)

Creatinine serum of >1,5 → 41,93% (13)

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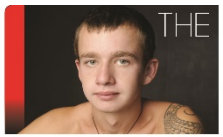

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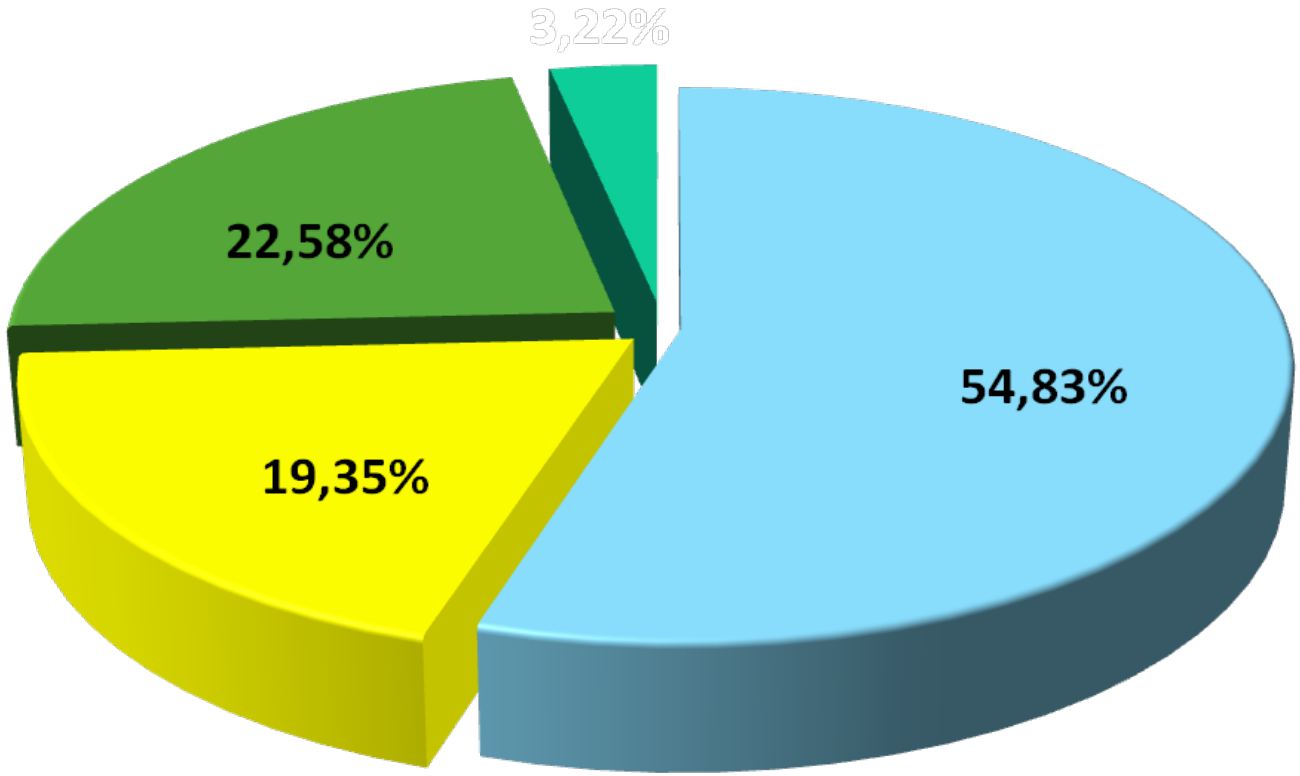
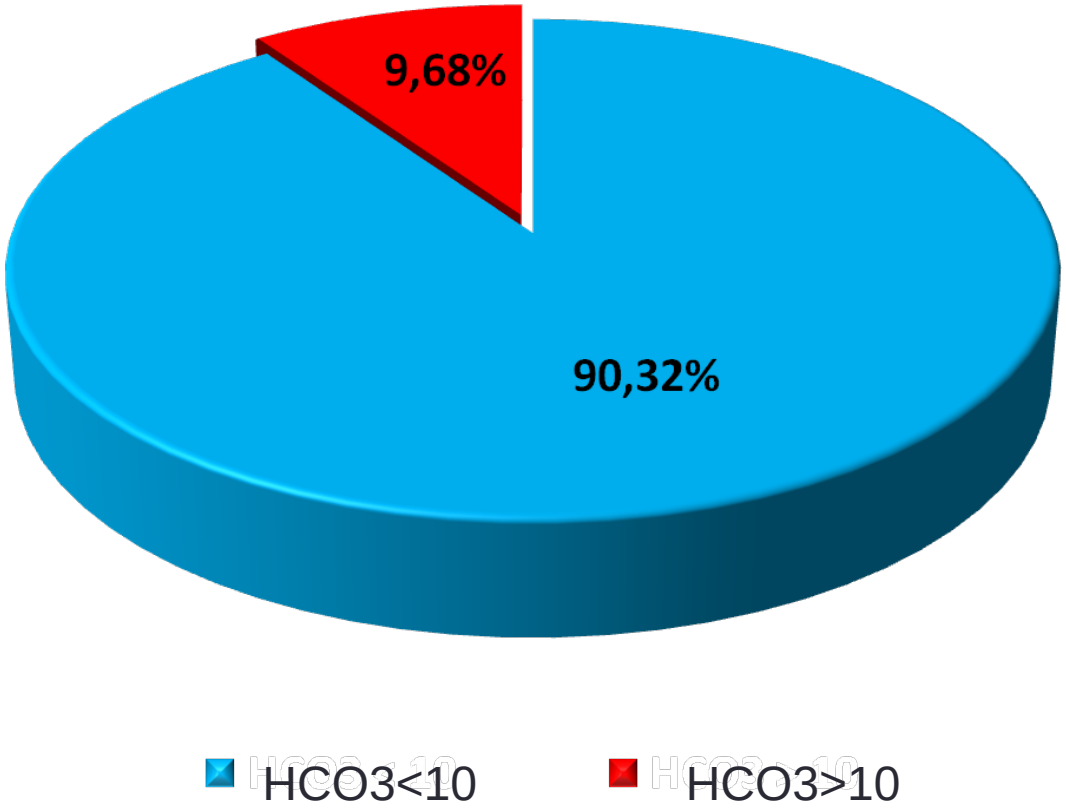
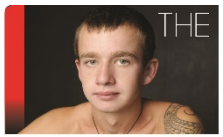
Characteristic of pH in Methanol Intoxication



Characteristic of HCO3 in Methanol intoxication

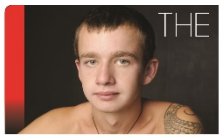


Results



- Of 17 patients who had pH < 7,1, 3 of them survived (had hemodialysis)
- 45,16% (14 patients) passed away due to severe metabolic acidosis (100% had pH < 7,1 and HCO3 < 10)
- 3 patients presented to the hospital with death on arrival

Conclusion



- Vision disturbance occurred the most in patients with methanol intoxication (70,96%)
- metabolic acidosis occured in patients with methanol intoxication (96,78%)
- 45,16% (14 patients) passed away and 100% of patients that passed away had severe metabolic acidosis (pH < 7,1 and HCO3 < 10 mEq/L)

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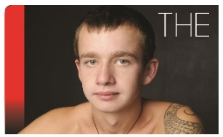

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SUGGESTION :

ALCOHOL INTOXICATION CASE: NEED TO BE CONSIDERED BEING INTOXICATED BY METHANOL AND THE MANAGEMENT

Patient should come earlier especially severe intoxication. Come late ➔ hard to be treated and fatal

Go to hospital that has hemodialysis unit

THE LAB RESULT SHOULD COME FASTER AND MEASURED CORRECTLY ➔ MANAGEMENT COULD BE CHOSEN

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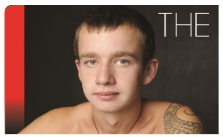

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SUGESTION :

DO NOT CONSUME ALCOHOL WITHOUT THE CLOSING LABEL

THE GOVERNMENT SHOULD BE FORBIDING THE BLEND OF ARAK WITH METHANOL

SEVERE CRIMINAL PUNISHMENT SHOULD BE ENFORCED FOR THOSE THAT SELL AN ALCOHOL MIXED WITH METHANOL

- **SUDHANA, AND FRIENDS IN 2009 REPORTED :**
- 31 INTOXICATION OF METHANOL AR 29 MALES, 2 FEMALES
- CLINICAL SYMPTOMS :
  - STOMACHACE
  - BREATHLESS
  - UNCONSIOUSNESS
  - BLURRY VISION
  - HYPOTENSION
  - DEATH

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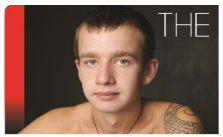

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Sudhana and friends in 2009 reported

- HEMATOLOGY DISTURBANCE FOUND:
  - leucosiytosis with *median count* 15.700
  - count leukosit < 15.700 got in 15 victims
  - ➔ 6 people (40%) died
  - count leukosit ≥ 15.700 goy in 16 victims
  - ➔ 8 people(50%) died.

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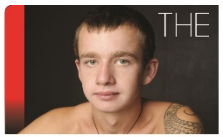

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Sudhana and friends in 2009 reported

- Polysitemia with *median count* level Hb 17 G/dL
  - Level Hb ≥ 17 G/dL : 14
  - ➔ 7 victims (50%) died.
  - level Hb < 17 G/dL : 17 victims
  - ➔ 7 victims (41,17 %) died.