HA NOI MEDICAL UNIVERSITY

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THE CLINICAL, SUBCLINICAL FEATURES AND TREATMENT OF DIABETES KETOACIDOSIS IN PREGNANCY

Guided by:

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BACKGROUND

- Diabetes Mellitus (DM) is a metabolic disorder which is characterized by hyperglucermia due to insulin deficiency or/and insulin action
- DM is increasing , 1-16% DM in pregnancy
- Diabetes ketoacidois: 1 -4%, complication for both the mother and the child.
- Researchs :
  - ✓ In the world: case studies
  - ✓ Viet Nam: DM in pregnancy

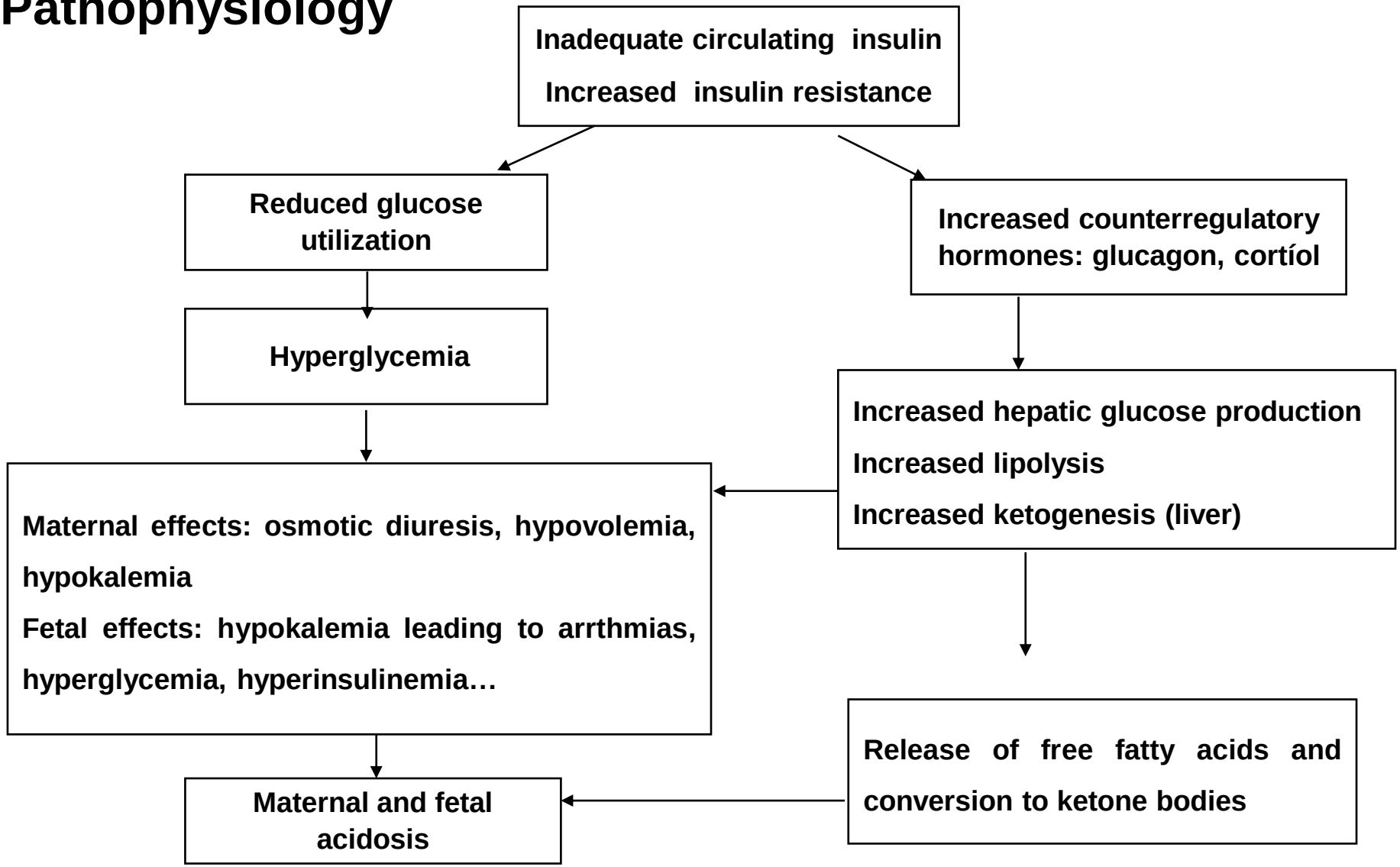
Montoro M. N., Myers V. P., Mestman J. H. et al. . (1993), "Outcome of pregnancy in diabetic ketoacidosis",*Am J Perinatol*, **10(1)**, tr. 17-20
Ramin K. D. (1999), "Diabetic ketoacidosis in pregnancy", *Obstet Gynecol Clin North Am*, **26(3)**, tr. 481-8

OBJECTIVES

1. Describe the clinical, subclinical features, related factors and the pregnancy outcomes of diabetes ketoacidosis in pregnancy. .
2. Evaluate the results of treatment for diabetes ketoacidosis in pregnancy

BACKGROUND

Pathophysiology



Sibai B. M. và Viteri O. A. (2014), "Diabetic ketoacidosis in pregnancy", *Obstet Gynecol*, **123(1)**, tr. 167-78.

BACKGROUND

Clinical features:

- Hyperglycemia symptoms: thirsty, dry…
- Dehydrated symptoms: dry skin, rapid pulse, hypotension..
- Acidosis symptoms: vomiting, abdominal pain, rapid breathing.
- Neurological symptoms: drowsiness, coma.

Subclinical features:

- Plasma glucose ≥ 13.9 mmol/l but may be lower in pregnancy
- Arterial blood gas: pH ≤ 7.3 and/or HCO3 ≤ 15
- Keton bodies in blood and/or urine: (+)

Results:

- Maternal : respiratory failure, acute renal failure, hypokalemia
- Fetal: miscarriage, stillbirth, arrhythmias

TREATMENT

Acidosis

ABG and anion gap

Insulin

Serum glucose and ketones q 1-2 hours
Regular insulinby IV infusion pump
Initiate therapy with 0.1 UI/kg then 0.1 UI/kg/hr

Underlying Causes

Rule out infection
Begin antibiotics if infection can be identified

Fetus

Fetal monitoring
Stabilize maternal condition prior to intervention

Dehydration

Foley catheter
Evaluate renal function

Fluid therapy

Estimate fluid deficit of 100 ml/kg bodyweight
Use 0.9% NS for initial replacemnet
Add dextrose to fluids when serum glucose < 13.9 mmol/l

Electrolyte replacement

Serum electrolytes q2-4h
Maintain serum K+ 4 – 5 mEq/l
NaHCO3 replacement not usually required

Carrol (2005): Diabetic ketoacidosis in pregnancy

METHOD

Objects

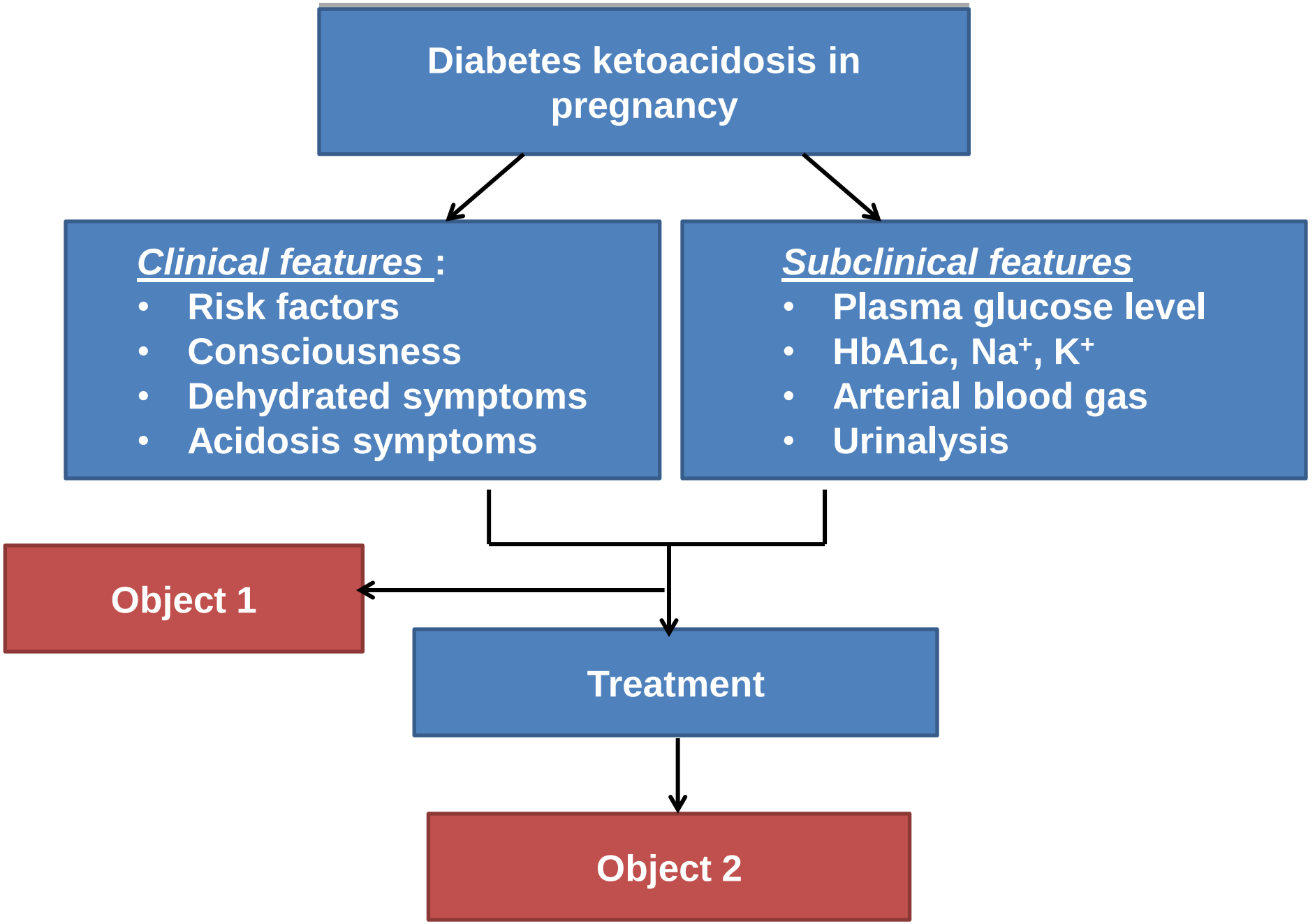
- 30 patients diagnosed with diabetes ketoacidosis in pregnancy

Research design

- Cross sectional description, prospective, retrospective study
- Convenient samples

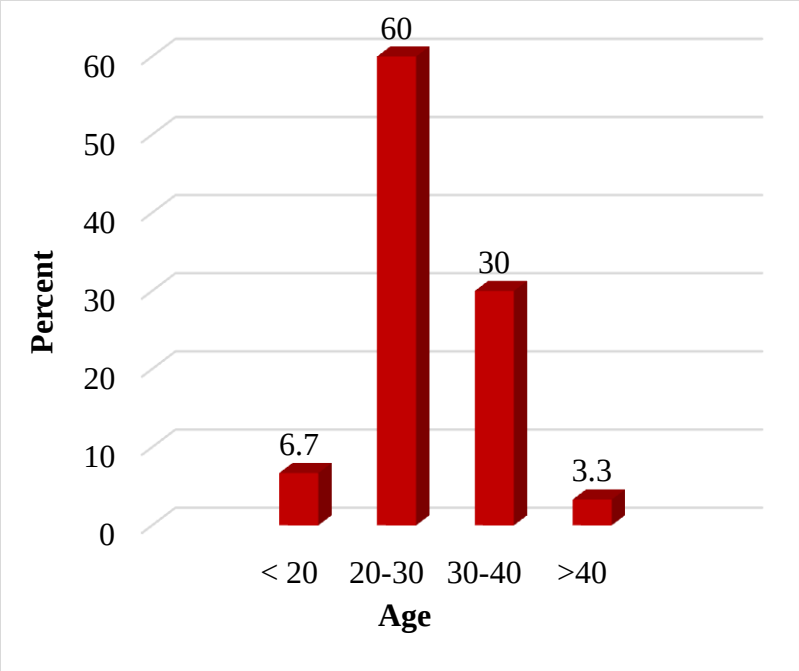
Time, place

- Retrospective time :1/2013 – 9/2016
- Prospective time: 9/2016 –11/2017
- Endocrinology department - Bach Mai hospital


Diabetes ketoacidosis in pregnancy
Clinical features :
• Risk factors
• Consciousness
• Dehydrated symptoms
• Acidosis symptoms
Subclinical features
• Plasma glucose level
• HbA1c, Na+, K+
• Arterial blood gas
• Urinalysis
Object 1
Treatment
Object 2

CLINICAL FEATURES

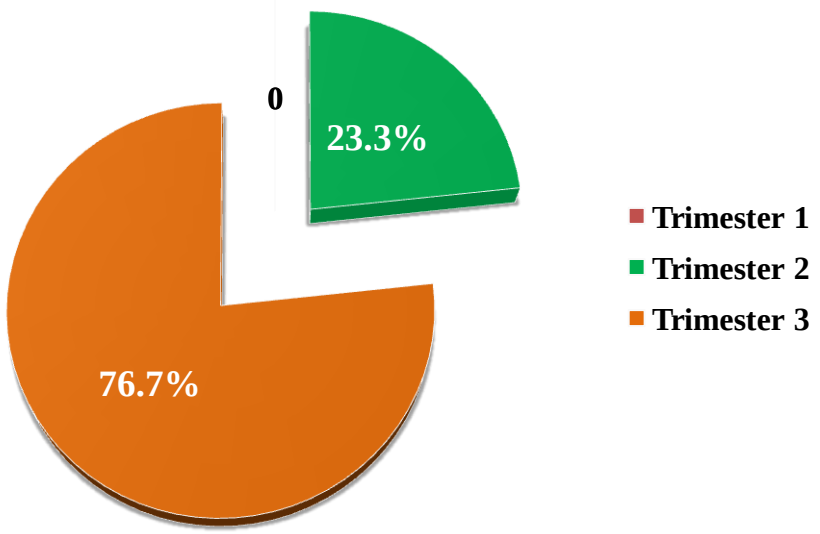
- **Maternal age**



Mean age: 28.6 ± 5.7

Bryant 25 ± 5 , Scheider 25 ± 1

Gestational age at admission



DM diagnostic time: 86.7% new diagnosis DM
13.3% prior DM

Bryant:85% prior DM (Trimester 1:47.5%), trimester 3 (22.5%)

CLINICAL FEATURES

- **Risk factors for acidosis**

Factors	N	%
No prior notice of diabetes before admission	26	86.7
Stop taking insulin	3	10
Fever before admitted	2	6.7
Use corticoid assist fetal lung maturation prior 3 days	1	3.3

Montoro: poor compliance(40%), infection(20%), unrecognized new onset of diabetes (30%) . Bedalov: use corticoid

CLINICAL FEATURES

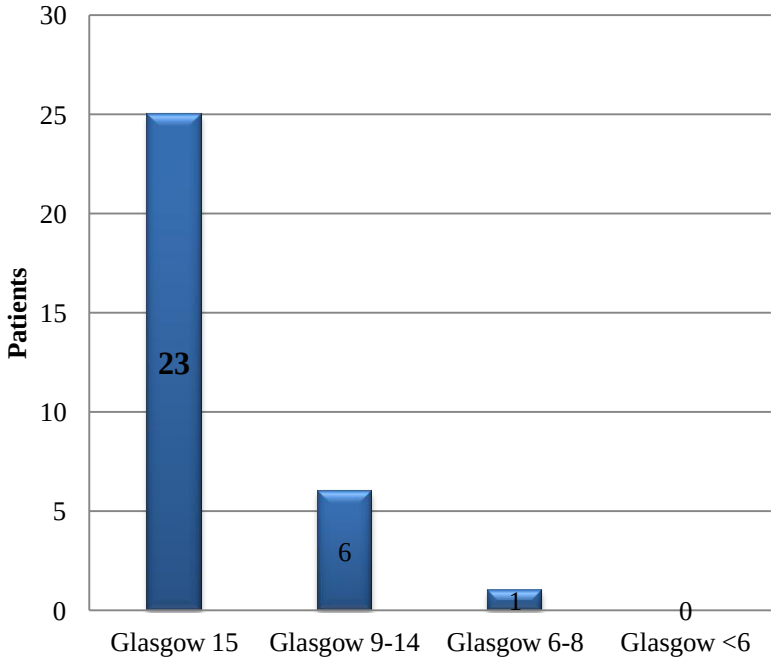
- **Chief complaints**

Chief complaints	N	%
Fatigues	30	100
Thirsty, frequent urination	30	100
Vomiting	19	63.3
Abdominal pain	11	36.7
Unconciousness	7	23.3
Fever	2	6.7
Fetal death	1	3.3

Bryant: 97% vomiting

CLINICAL FEATURES

- **Clinical features on examination**



Clinical features	Clinical features	N = 30	%
Dehydrated symptoms	Dry skin	30	100
	Rapid pulse	20	66.7
	Hypotension	2	6.7
Acidosis symptoms	Deep, rapid breath	13	43.3
	Ketone in breath	0	0

SUBCLINICAL FEATURES

- **Plasma glucose at admitted**

Glucose (mmol/l)	N = 30	%
≤ 13.9	1	3.3
>13.9	29	96.7
Mean ± SD	34.4 ± 15.6	

Bryant: 21 mmol/l. Cullen (1996):36% glucose<13.9, Montero:10%.

SUBCLINICAL FEATURES

- **Arterial blood gas : pH: 7.18 ± 0.14**

  HCO3: 7.7 ± 4.0 mEq/l

	N	%
Mild	**10**	**33.3**
Moderate	**15**	**50**
Severe	**5**	**16.7**
Tổng	**30**	**100**

Bryant: 7,27 ± 0,02, $HCO3^-$ là 11,9 ± 0,96 mEq/l , Schneider:7,22 ± 0,01, $HCO3^-$ là 7,9 ± 3 mEq/l

SUBCLINICAL FEATURES

- **HbA1c level**

HbA1c level	N	%
HbA1c < 6.5	16	53.3
HbA1c ≥ 6.5	14	46.7
N	30	100
Mean ± SD (%)	7.5 ± 2.6	

Otsubo (2002): Nonimmune "Fulminant" type 1 diabetes presenting with diabetic ketoacidosis during pregnancy

SUBCLINICAL FEATURES

Degree of urinary ketosis

	N	%
Ceton (1+)	4	13.3
Ceton (2+)	1	3.3
Ceton (3+)	25	83.4
Sum	30	100

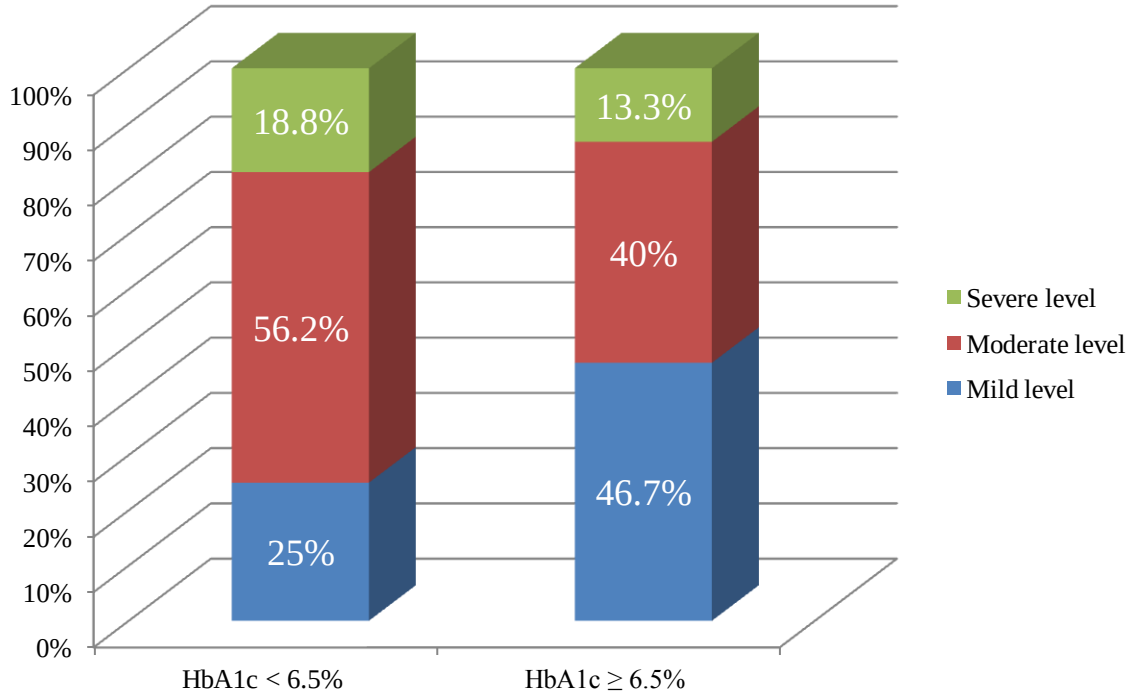
Relative of ketouria and pH, $HCO3^-$

	pH	$HCO3^-$
Ceton 1+ and 2+	7.2 ± 0.1	9.7 ± 5.8
Ceton 3+	7.2 ± 0.1	7.2 ± 3.5
P	0.764	0.204

Sack (2011): Ceton (+)

RELATIVE OF ACIDOISIS LEVEL AND HbA1C

- **Relative of acidosis level and HbA1c**



TREATMENT

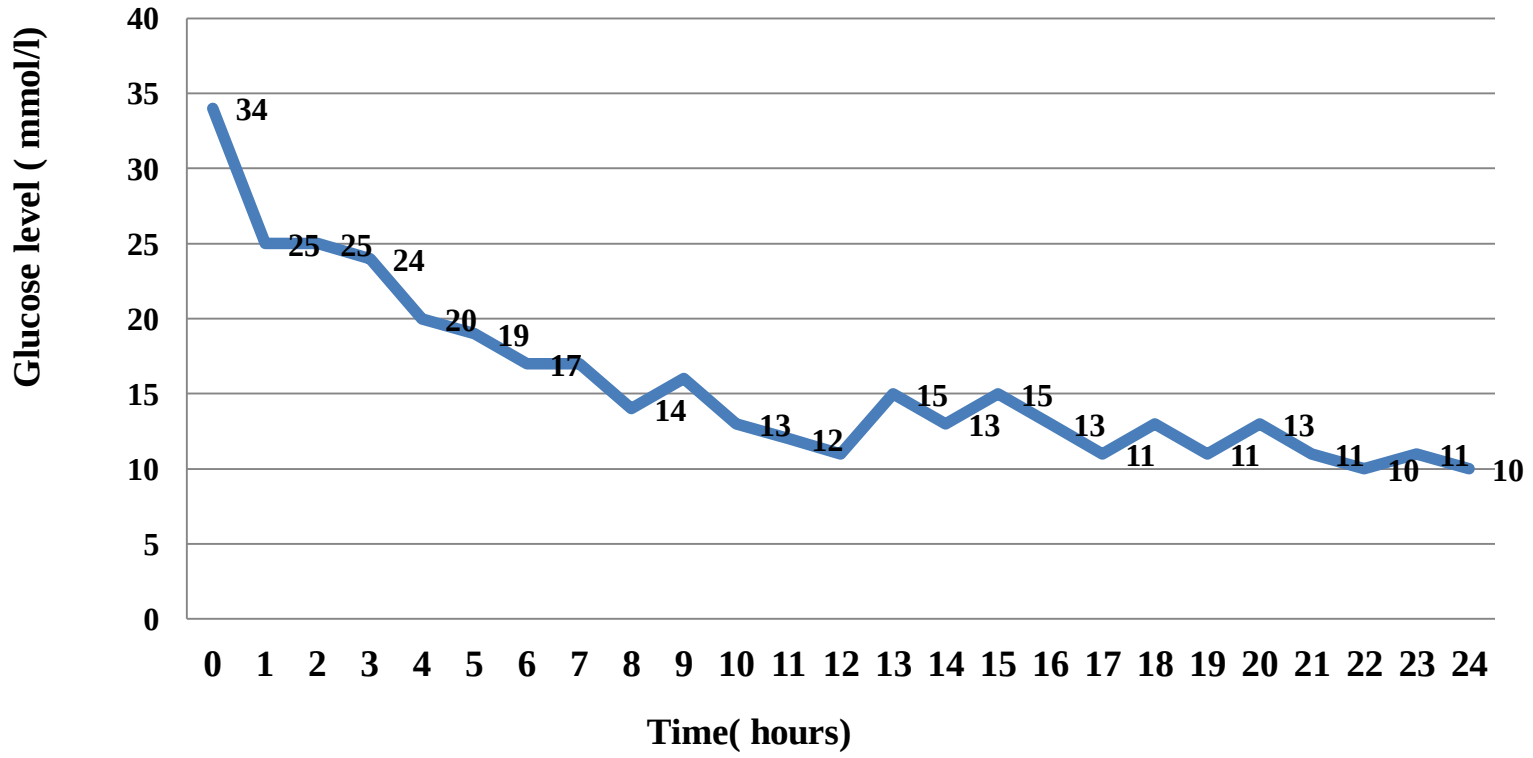
- **Resolution of ketonemia in arterial blood gas**

Time (hour)	N = 27	%
≤ 12 hours	1	3.7
12 - ≤ 24 hours	6	22.2
> 24 hours	20	74.1

Bryant: anion gap normalized by 8 hour in most woman

TREATMENT

- **Glucose response after 24 hours**



Bryant: after 6h

OUTCOME OF PREGNANCY AND RELATED FACTORS

Outcome of pregnancy

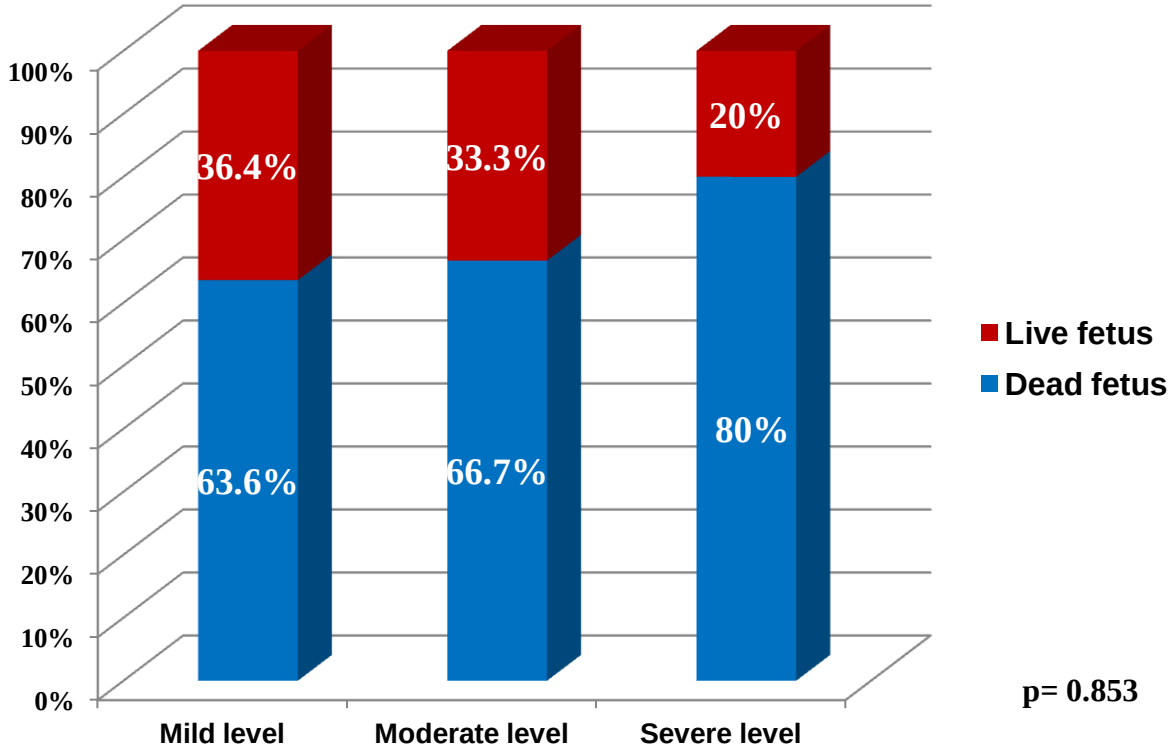
Complications		N = 30	%
Dead fetus		21	70
Live fetus (N = 9)	High birthweight	2	6.7
	Polyhydramnios	3	10

26 new diagnosis patients: 20/26 BN (76.9%) dead fetus
4 prior disgnosis patients: 1/4 BN (25%) dead fetus

Montoro: fetus deaths: 35%

OUTCOME OF PREGNANCY AND RELATED FACTORS

Relative of acidosis level and outcome of pregnancy



p= 0.853

OUTCOME OF PREGNANCY AND RELATED FACTORS

Characteristics of 2 groups

	Live fetus (N= 9)	Dead fetus (N = 21)	P
Glucose	20.6 ± 4.8	40.4 ± 14.9	0.000
HbA1c	8.3 ± 3.1	7.1 ± 2.4	0.24
pH	7.2 ± 0.1	7.2 ± 0.1	0.57
$HCO3^-$	8.6 ± 5.6	7.2 ± 3.1	0.496
Insulin 24 hours	99.5 ± 35.9 (N = 9)	87.0 ± 17.6 (N = 18)	0.376

Montoro: Significantly different : glucose, insulin requirement, length of resolution

CONCLUSIONS

1. The clinical, subclinical features and relationship with other factors

- Risk factor: 86.7% no prior notice of diabetes.
- Clinical features: fatigue, thirsty, frequent urination(100%), vomiting (63.3%), abdominal pain (36.7%)
- Mean plasma glucose: 34.4 ± 15.6 mmol/l, 96.7% patients have glucose > 13.9 mmol/l. 46.7 % patients have HbA1c level ≥ 6.5%.
- Moderate and severe acidosis level: 66.7% . Ketouria level 3+ : 83.4%.
- The correlation was not significant between glucose and blood pH: r = -0.379, p = 0.039. No correlation between the level of acidosis and HbA1c.

CONCLUSIONS

2. Treatment

- 74.1% patients reach normal pH/ HCO_3^- after 24 hours
- Dead fetus at admitted: 70%
- Different features between live fetus and dead fetus:
  - Different feature: glucose level at admitted $p < 0.05$
  - Not different features: acidosis level, HbA1c, pH, HCO_3^-, insulin 24 hours

RECOMMENDATION

Endocrinology and obstetricians should early detect clinical, subclinical features, then treat and eliminate risk factors for ketoacidosis even if the blood glucose level is not too high to minimize severe complications on fetus.

Thank you for your attention