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# Hemoglobin A1c predicts heart failure hospitalization independent of baseline cardiac function or B-type natriuretic peptide level

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# Background

- Le diabète est un facteur de risque majeur de l'insuffisance cardiaque (IC).
- Il n'y a aucune preuve claire expliquant si un taux d'HbA1c élevé prédit l'incidence de la HF-delà de ces co-morbidités.
- Nous avons examiné si le niveau de référence de l'HbA1c prédit IC incidence indépendant des autres facteurs de risque de IC, y compris des anomalies structurelles et fonctionnelles cardiaques de base.

# Methods

- Département d'endocrinologie et métabolisme, Centre national cérébrale et Cardiovasculaire, Osaka, Japon.

  Janvier 2000 au 31 Décembre 2007.
- 608 de ces patients qui étaient asymptomatiques pendant  IC (classe 1 de la New York Heart Association (NYHA) la classification fonctionnelle) au départ.
- Caractéristiques épidémiologiques, US cardiaque, suivi ...
- La durée médiane de suivi était de 6 ans.

# Results

**Table 1 – Cox proportional hazard analysis with three different models.**

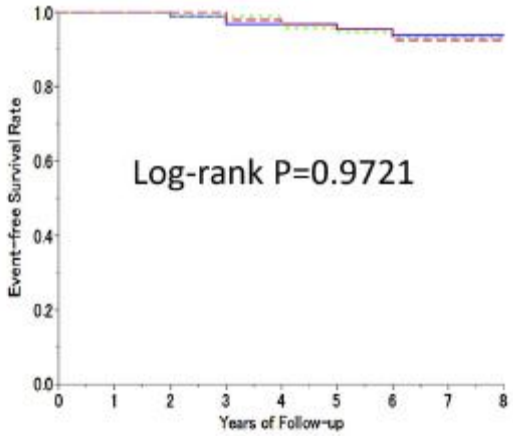
| | First HF hospitalization | | | Censoring coronary event | | |
|---|---|---|---|---|---|---|
| | Hazard ratio | 95% CI | P-value | Hazard ratio | 95% CI | P-value |
| $HbA_{1c}$ (continuous) | | | | | | |
| Model 1 | 1.17 | 1.05–1.30 | 0.0065* | 1.21 | 1.08–1.35 | 0.0011* |
| Model 2 | 1.23 | 1.1–1.37 | 0.0004* | 1.28 | 1.14–1.44 | 0.0001* |
| Model 3 | 1.19 | 1.02–1.39 | 0.0272* | 1.30 | 1.10–1.52 | 0.0023* |
| $HbA_{1c}$ (categorical) | | | | | | |
| Model 1 | | | | | | |
| Tertile 1 (<8.4%) | Referent | | | Referent | | |
| Tertile 2 (8.4–9.5%) | 1.41 | 0.82–2.45 | 0.2142 | 1.79 | 0.98–3.40 | 0.0597 |
| Tertile 3 (9.6%≤) | 1.96 | 1.18–3.35 | 0.0095* | 2.72 | 1.54–5.03 | 0.0005* |
| Model 2 | | | | | | |
| Tertile 1 (<8.4%) | Referent | | | Referent | | |
| Tertile 2 (8.4–9.5%) | 1.54 | 0.90–2.71 | 0.118 | 2.01 | 1.10–3.82 | 0.0247* |
| Tertile 3 (9.6%≤) | 2.24 | 1.33–3.87 | 0.0023* | 3.10 | 1.75–5.78 | 0.0001* |
| Model 3 | | | | | | |
| Tertile 1 (<8.4%) | Referent | | | Referent | | |
| Tertile 2 (8.4–9.5%) | 1.85 | 0.88–4.05 | 0.1030 | 3.41 | 1.32–10.50 | 0.0101* |
| Tertile 3 (9.6%≤) | 2.10 | 1.01–4.59 | 0.0458* | 4.34 | 1.73–13.21 | 0.0013* |

(Above) Hazard ratios of HF for each 1% increase in $HbA_{1c}$. (Below) Hazard ratios of HF for increasing category of $HbA_{1c}$ as compared to the referent ($HbA_{1c}$ < 8.4% (68 mmol/mol)). $HbA_{1c}$ was modeled as a categorical variable with cut points of 8.4% (68 mmol/mol) and 9.6% (81 mmol/mol). Model 1; adjusted by age, sex, body mass index, systolic blood pressure and eGFR. Model 2; adjusted by factors in model 1 and BNP. Model 3; adjusted by factors in model 1, left ventricular ejection fraction and the E/A ratio.

* $P < 0.05$.

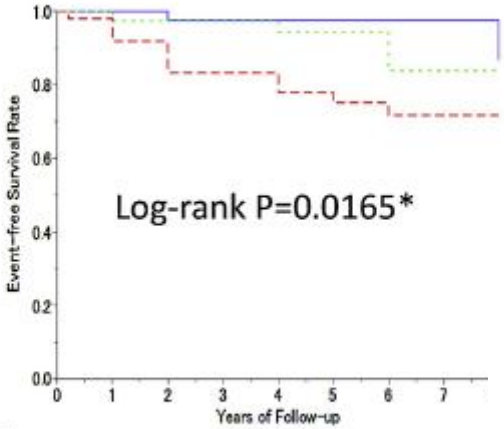
# Results

a BNP<39



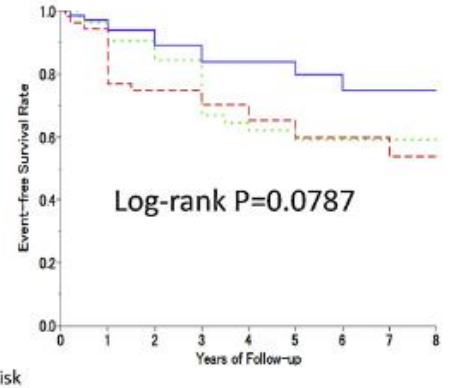

| Number at risk | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| HbA1c < 8.4 | 96 | 96 | 93 | 91 | 83 | 76 | 59 | 39 | 22 |
| 8.4≤HbA1c <9.6 | 104 | 103 | 99 | 95 | 91 | 86 | 67 | 35 | 18 |
| 9.6≤HbA1c | 106 | 105 | 100 | 95 | 82 | 75 | 66 | 34 | 17 |

b 39≤BNP<90




| Number at risk | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| HbA1c < 8.4 | 42 | 42 | 41 | 31 | 29 | 28 | 22 | 17 |
| 8.4≤HbA1c <9.6 | 38 | 38 | 37 | 36 | 33 | 31 | 27 | 13 |
| 9.6≤HbA1c | 50 | 48 | 43 | 34 | 31 | 28 | 22 | 10 |

c 90≤BNP




| Number at risk | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| HbA1c < 8.4 | 67 | 62 | 58 | 52 | 52 | 42 | 32 | 16 | 7 |
| 8.4≤HbA1c <9.6 | 53 | 50 | 45 | 39 | 27 | 21 | 16 | 5 | 2 |
| 9.6≤HbA1c | 52 | 49 | 36 | 33 | 29 | 24 | 18 | 10 | 7 |

# Results

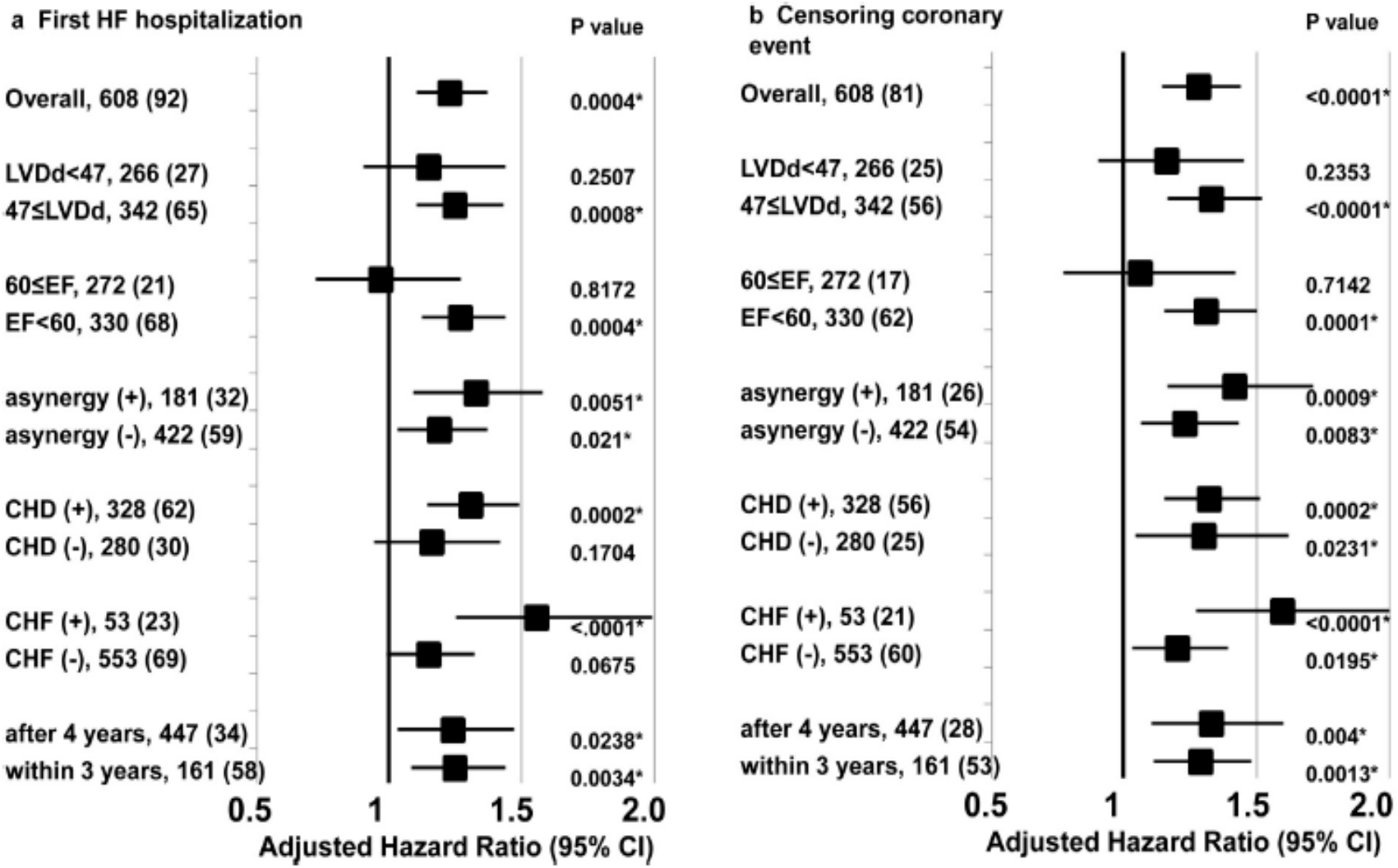
c First HF hospitalization

| BNP category | HbA1c category | Hazard ratio | 95%CI | P value |
|---|---|---|---|---|
| BNP<39 | HbA1c<8.4 | Referent | | |
| | 8.4≤HbA1c<9.6 | 1.16 | 0.35-4.03 | 0.8071 |
| | HbA1c≥9.6 | 1.3 | 0.39-4.55 | 0.6637 |
| 39≤BNP<90 | HbA1c<8.4 | Referent | | |
| | 8.4≤HbA1c<9.6 | 1.53 | 0.37-7.48 | 0.5553 |
| | HbA1c≥9.6 | 3.54 | 1.13-15.5 | 0.0286 * |
| BNP≥90 | HbA1c<8.4 | Referent | | |
| | 8.4≤HbA1c<9.6 | 1.83 | 0.93-3.67 | 0.0787 |
| | HbA1c≥9.6 | 2.07 | 1.06-4.14 | 0.0343 * |

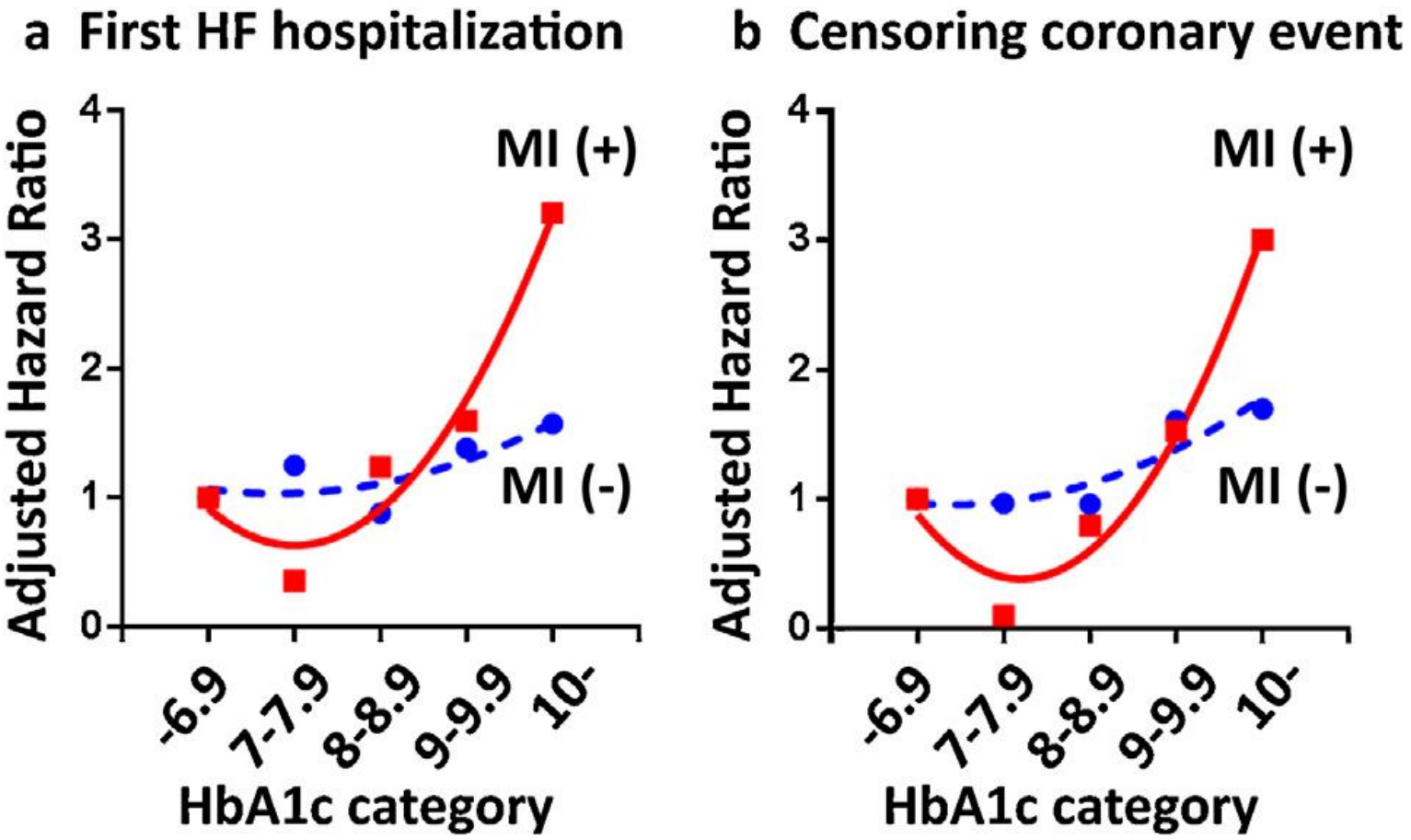
d Censoring coronary event

| BNP category | HbA1c category | Hazard ratio | 95%CI | P value |
|---|---|---|---|---|
| BNP<39 | HbA1c<8.4 | Referent | | |
| | 8.4≤HbA1c<9.6 | 1.58 | 0.39-7.69 | 0.5281 |
| | HbA1c≥9.6 | 2.12 | 0.56-10.1 | 0.2745 |
| 39≤BNP<90 | HbA1c<8.4 | Referent | | |
| | 8.4≤HbA1c<9.6 | 1.4 | 0.23-10.6 | 0.7132 |
| | HbA1c≥9.6 | 5.25 | 1.41-33.9 | 0.0108 * |
| BNP≥90 | HbA1c<8.4 | Referent | | |
| | 8.4≤HbA1c<9.6 | 2.41 | 1.16-5.25 | 0.018 * |
| | HbA1c≥9.6 | 2.6 | 1.26-5.66 | 0.0097 * |

# Results


a First HF hospitalization
P value
Overall, 608 (92)
0.0004*
LVDd<47, 266 (27)
0.2507
47≤LVDd, 342 (65)
0.0008*
60≤EF, 272 (21)
0.8172
EF<60, 330 (68)
0.0004*
asynergy (+), 181 (32)
0.0051*
asynergy (-), 422 (59)
0.021*
CHD (+), 328 (62)
0.0002*
CHD (-), 280 (30)
0.1704
CHF (+), 53 (23)
<.0001*
CHF (-), 553 (69)
0.0675
after 4 years, 447 (34)
0.0238*
within 3 years, 161 (58)
0.0034*
0.5
1
1.5
2.0
Adjusted Hazard Ratio (95% CI)
b Censoring coronary event
P value
Overall, 608 (81)
<0.0001*
LVDd<47, 266 (25)
0.2353
47≤LVDd, 342 (56)
<0.0001*
60≤EF, 272 (17)
0.7142
EF<60, 330 (62)
0.0001*
asynergy (+), 181 (26)
0.0009*
asynergy (-), 422 (54)
0.0083*
CHD (+), 328 (56)
0.0002*
CHD (-), 280 (25)
0.0231*
CHF (+), 53 (21)
<0.0001*
CHF (-), 553 (60)
0.0195*
after 4 years, 447 (28)
0.004*
within 3 years, 161 (53)
0.0013*
0.5
1
1.5
2.0
Adjusted Hazard Ratio (95% CI)

# Results


a First HF hospitalization
b Censoring coronary event
Adjusted Hazard Ratio
0
1
2
3
4
MI (+)
MI (-)
-6.9
7-7.9
8-8.9
9-9.9
10-
HbA1c category

# Conclusion

- En résumé, l'HbA1c est un prédicteur de l'hospitalisation des IC indépendamment de référence BNP ou les paramètres de la fonction cardiaque chez les patients atteints de diabète de type 2 à haut risque de IC.
- Les résultats suggèrent que les mesures de dépistage et de prévention pour IC doivent être menées chez des patients avec un mauvais contrôle glycémique, même chez ceux sans symptômes cliniques manifestes d'IC.

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